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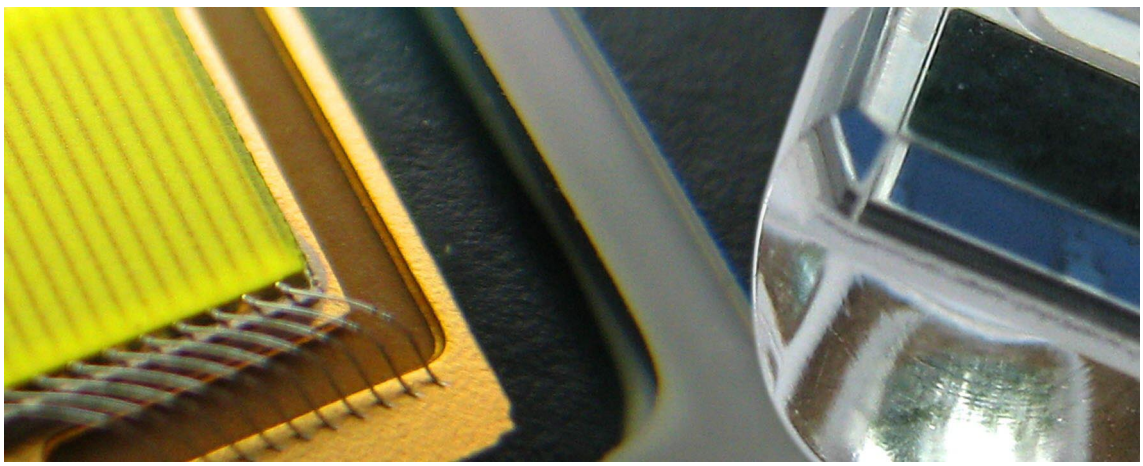

HPLL ILLUMINATION MODULE SERVICE MANUAL AND TROUBLESHOOTING GUIDE

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This Manual

This manual is designed to give service instructions and troubleshooting information for the Basler SENSIC HPLL illumination module.

It contains important information on how to service the illumination module safely, properly and most efficiently. Observing the manual helps to avoid danger, to reduce repair costs and downtime and to increase the reliability and life time of the light source.

The manual must be read and applied by any person who sets up, services or troubleshoots the illumination module. The manual must always be available wherever the lillumination module is in use.

For a full description of the Basler SENSIC inspection system and its capabilities, this document must be used together with the Basler SENSIC hardware operating manual, software operating manual, service manual and troubleshooting guide.

Warranty

Basler AG is not liable for damage caused as a consequence of disregarding this manual! In addition, the warranty may become void.

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1 Safety Instructions

1.1 Conventions Used in This Manual

The following symbols are used for safety instructions and other important notes:

	Danger Refers to orders and prohibitions designed to prevent injury or extensive damage.
	Danger Refers to orders and prohibitions designed to prevent injury caused by touching hot surfaces.
	Danger Refers to orders and prohibitions designed to prevent injury or extensive damage caused by high electric voltage.
	Danger Refers to orders and prohibitions designed to prevent injury caused by bright light.
	Caution Refers to special information and/or orders and prohibitions directed towards preventing damage.
	Note: Provides special information on how to use the system most efficiently.

1.2 Designated Use

The HPLL module (High Power LED Light module) is exclusively designed to be used in a Basler SENSIC inspection system. Using the HPLL modules for purposes other than those mentioned above is considered contrary to its designated use. The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of any misuse lies entirely with the user. Operating the HPLL module within the limits of its designated use also involves observing the instructions set out in this manual and complying with the maintenance directives.

1.3 Electric Shock

Danger

ELECTRIC SHOCK

Contact with open cables will cause electric shock.

Melting fuses before the main switches remain under power even if the main switch is switched off. Contact may cause death, electric shock or burn.

- Work on the **electric system** or equipment must **only be carried** out by a **skilled electrician** or by **specially instructed personnel** under the control and supervision of an electrician and in accordance with the applicable electric engineering rules.
- Turn off and unplug system power immediately, if a fault occurs in the electric system.
- Never work on the electric system with power switched on. Turn off and unplug system power before servicing or repair.
  Use a lock-out device to prevent inadvertent power-on.
  If work on the electric system with power switched on is required (e.g. resetting the operating time counter of the LCU), this work must **only be carried** out by a **skilled electrician** or by **specially instructed personnel**.

1.4 Heavy Loads

Danger

To avoid injury to persons and damage to the HPLL module, make sure that you are two persons when removing or mounting the HPLL module:

One person must hold the HPLL while the other person looses or tighten the screws of the HPLL.

If you do not take these precautions, the HPLL

- can fall down and hurt you, and
- can be damaged.

1.5 Hot Surface

Danger

HOT SURFACE

Do not touch the HPLL modules in the area around the fiber cable connector (Fig. 1). The area can reach a temperature of **50 °C**.

Fig. 1: Hot Area Around Fiber Cable Connector

Parts of the HPLL Light Engine can reach a temperature of about **70 °C**.
The temperature of about 70 °C is only reached inside the mounted HPLL module and only if the HPLL module is powered on. Before you disassemble the HPLL module (e.g. for exchaning the Light Engine), turn off and disconnect power.

Only operate the HPLL module when all parts are in place.

1.6 Bright Light

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes.
Danger of becoming blind!
Never look into the light. Never open the HPLL module while the light is still switched on.

- Before operating the HPLL modules make sure that the fiber cable is mounted to the fiber connector.
- Before removing the fiber connector make sure that the system power for the HPLL modules is turned off and unplugged.

1.7 Maintenance, Service and Repairs

Danger

QUALIFICATION REQUIRED

To avoid injury, make sure that maintenance and service are performed by qualified technicians only.

Repair must be performed by Basler Technical Service at the Basler factory only.

You must not operate the HPLL module when parts of the Light Engine are removed.

HPLL Instructions

- When you turn off the HPLL illumination modules, **wait at least 5 seconds** before turning them on again. This way you make sure that the LCU in the HPLL modules can boot properly.
- Remove the fiber connector, before loosening the HPLL. Pulling and bending the fiber connector can break fibers inside, which leads to reduced light intensity.

1.8 Spare Parts

Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied on to do so.

For spare part information, please contact Basler Technical Support. The support addresses appear on the back of the title page of this manual.

2 Preparing an HPLL Module for Transport and Operation

2.1 Preparing the HPLL Module for Transportation

To prepare the HPLL module for transportation:

1. Make sure that the HPLL module has cooled down.
2. Remove all cable connections (CAN bus cable and power supply cable) and the optical fiber connector.
3. Cover the front of the optical fiber connector by carefully inserting a plastic plug.
   See Fig. 2.

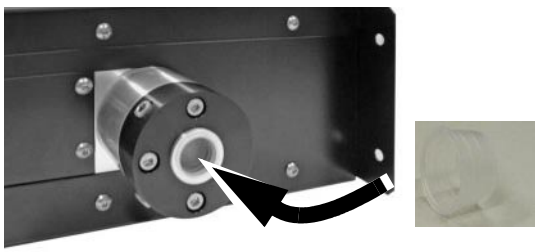


Fig. 2: Plastic Plug for Transport

4. At the rear side of the HPLL module housing:

   Remove the cable catch from the corresponding bolts of the cold appliance connector.
   See Fig. 3 and Fig. 4.

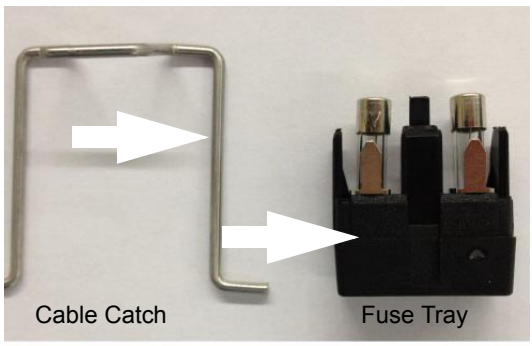


Fig. 3: Cable Catch and Fuse Tray With Fuses (2.5 AT)

5. Remove the fuse tray from the fuse bay of the cold appliance connector.

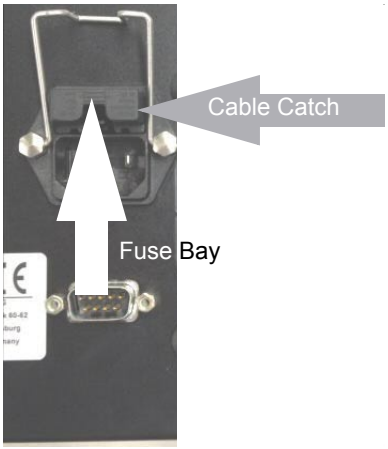


Fig. 4: Location of Cable Catch and Fuse Tray

2.2 Preparing the HPLL Module for Operation

To prepare the HPLL module for operation:

If the HPLL module is sent as a spare part, a plastic bag containing required material for the mounting is attached to the HPLL housing (cable catch, fuse/ and, when HPLL replaces HQI module: screws and fasteners for the lamp box).

1. At the rear side of the HPLL module housing:

   Mount the cable catch in the corresponding bolts of the cold appliance connector.
   Make sure the cable catch is correctly orientated as shown in Fig. 5.

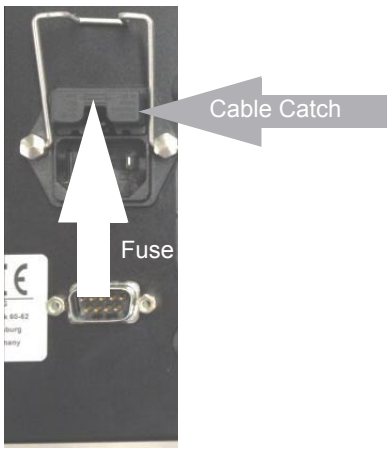


Fig. 5: Location of Cable Catch and Fuse Tray

2. Mount the fuse tray with two fuses in the bay of the cold appliance connector.

3. Make sure that you are in a clean room environment when performing the following step:

   Carefully remove the plastic plug from the front of the optical fiber connector. See Fig. 6.

   Keep the plastic plug and store it so that you can use it if the HPLL module has to be shipped to a different location.

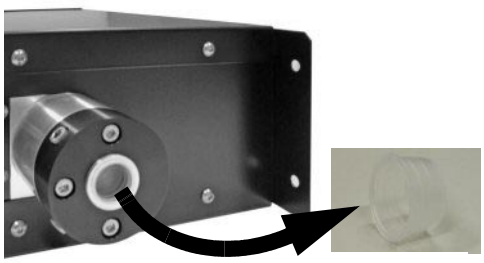


Fig. 6: Removing Plastic Plug from Fiber Connector

4. Mount all cable connections (CAN bus cable and power supply cable) and the optical fiber connector to the HPLL module.

3 Functional Description

3.1 General

An HPLL module uses a coupling optics for coupling the light from a light emitting diode to a single mode fiber. Via the interfacing fiber cable the light is then conducted to the substrate.

HPLL stands for **H**igh (**H**) **P**ower (**P**) **L**ED (**L**) **L**ight (**L**).

3.2 Technical Specifications of HPLL Module

Power consumption	Up to 200 W
Operating time of LED	approx. 30,000 h
Base type	IEC - C14
Color temperature	6,500 K
Initial lumens	3,000 lm
Operating voltage (rated)	230 VAC 50/60Hz
Operating current (rated)	1.5 A
Back-up fuse	max. 10 A
Fuse in fuse tray in HPLL module	max. 2.5 AT (slow blow)

Table 1: Technical Specifications of HPLL Module

3.3 Basic Operation

The HPLL module serves as light source for various types of visual quality control. It offers the possibility of closed loop control and can be parameterized via CAN bus messages.

The Basler SENSIC software (release 8.0 and later) supports the HPLL module. When starting the **Line Scan Controller** software, it sets the parameters given in the machine parameter set and switches on all HPLL modules stated in the machine parameter set.

Fig. 7: Line Scan Controller

Fig. 7: For service purposes, select the **Illumination** button in **Line Scan Controller**.
An **Illumination Control** window will appear which, among other things, displays the intensity, operating time, temperature and the output control voltage of the illumination modules (output control voltage in this case is a value that is the equivalent to the LED current). You can also switch HPLL modules and the shutter mode (see 3.3.1 on page 13) in the **Illumination Control** window.

For a detailed description of the **Illumination Control** window, see the Basler SENSIC service manual.

3.3.1 Shutter Mode

Certain tasks (e.g. media adaptation or intensity correction) demand several cycles with the illumination rapidly switched on and off.

The HPLL module emulates a shutter mode by switching the LED on an off instead of moving a mechanical shutter plate.

Due to downward compatibility reasons (i.e. other illumination types have a mechanical shutter) the switching on or off of the HPLL LED is treated in the software as ’shutter mode’.

Shutter Mode Status	HPLL Module	Illumination Type With Mechanical Shutter
Status 03	Sets the module into ’shutter closed’ status. This status is present for compatibility reasons. The LED is switched off.	Shutter closed
Status 01	LED is switched on.	Shutter open
Status 00	LED is switched off.	Shutter open

The initial shutter mode status can be parameterized.

You can access the shutter mode via **Line Scan Controller**.

It is not possible to scan with the system in ’shutter closed’ state. When the scan is started (**Start** button in **Line Scan Controller** is selected), **Line Scan Controller** automatically switches the LED(s) on, i.e. to ’shutter open’ status.

For service purposes, you can open an **Illumination Control** window on the line scan station. In this window you can view the status of all installed illumination modules and control them individually or all together.

3.3.2 Temperature Control

A temperature sensor is located close to the LED. This sensor switches the HPLL module off as soon as the temperature of the sensor reaches 72° C. The temperature error parameter is set so that the HPLL module is switched off.

3.3.3 Intensity Control

You can vary the intensity of the HPLL module between 10% and 100%. A photo diode located close to the fiber connector measures the actual output intensity.

The range of the LED intensity can vary between 10 - 100 % by modifying the LED current between 1 and 10 A.

For detailed information on the corresponding parameters (e.g. LIGHT_GROUP_INTENSITY_TARGET_VALUE, LIGHT_GROUP_INTENSITY_TARGET_CORRECTION_FACTOR, and LIGHT_GROUP_INTENSITY_CONTROL_INTERVAL), see the Basler SENSIC service manual.

3.3.4 Closed Loop Control

When closed loop control is switched on, the signal of the intensity sensor is compared with the target value by a PI control unit which controls the output stage on the LCU.

When closed loop control is switched off, you can set the control signal for the HPLL module's power supply unit directly (via the LIGHT_GROUP_INTENSITY_TARGET_VALUE machine parameter).

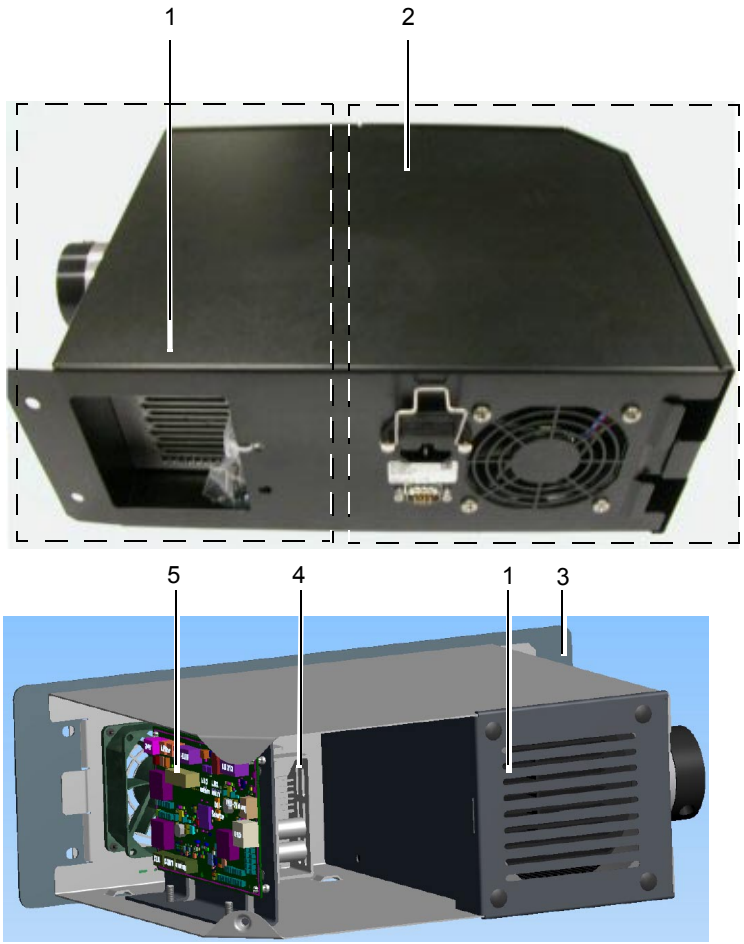
3.3.5 Status LEDs

The illumination module permanently monitors its own operational status. For details refer to Section 4.3.4 on page 20.

4 Hardware Components

4.1 Main Components

The HPLL module consists of the following main components:



(1) Light Engine

(2) Supply and control unit [including power supply unit (4) and LED control unit (5)]

(3) Lamp box plate

Supply and control unit

(4) Power supply unit

(5) LCU (LED control unit)

Fig. 8: Main Components of HPLL Module

4.2 Light Engine

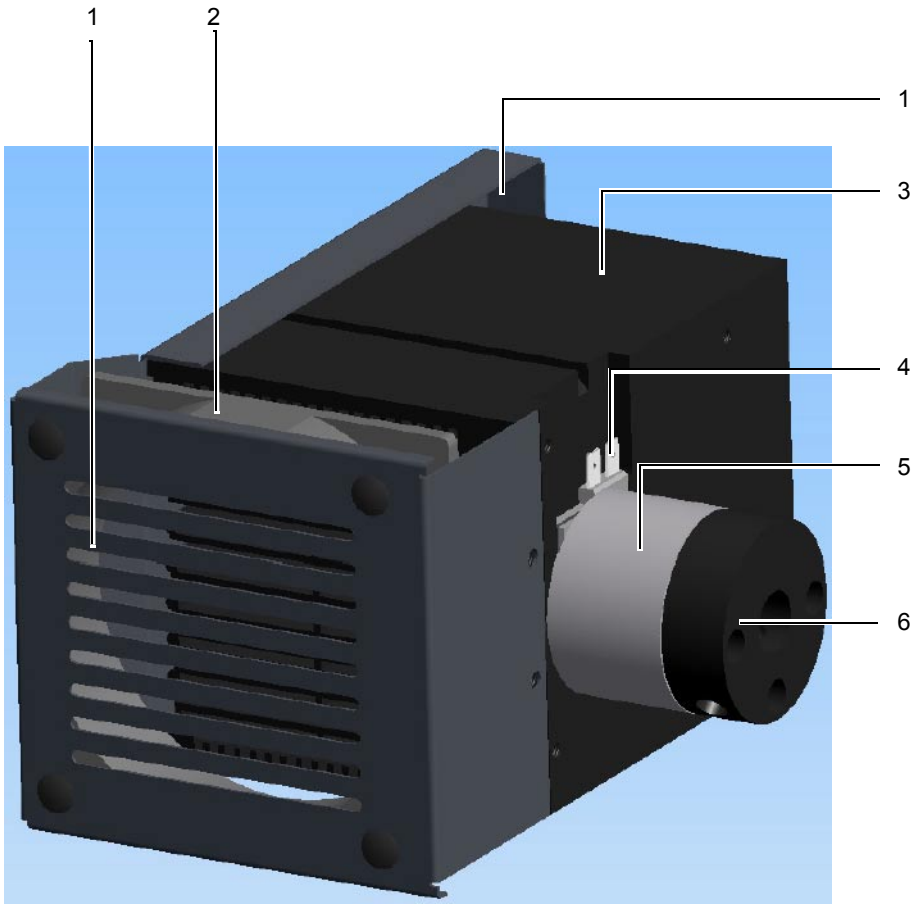


Fig. 9: Light Engine (Schematic Design)

(1) Air baffle
(2) Fan
(3) Cooling element (heat sink)
(4) LED element with temperature sensor
(5) Mounting device for coupling optics (coupling optics mounted inside - not visible)
(6) Fiber Connector

4.3 Supply and Control Unit

4.3.1 Power Supply Unit

Fig. 10: The power for the HPLL module is supplied via the power supply unit (**1**).
It uses 50 Hz 230 V AC voltage input, and supplies 24 VDC.

The power supply unit comprises a line input port and an output port to the LCU.

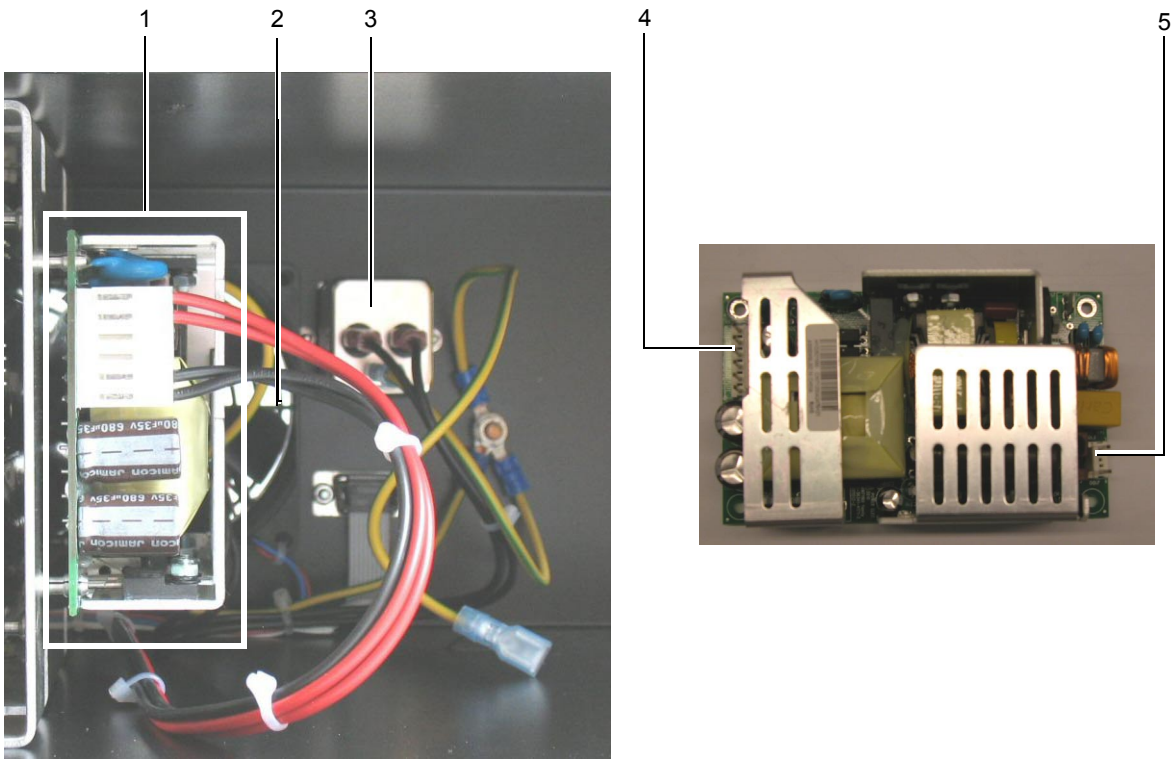


Fig. 10: Power Supply Unit (Similar Connector)

(1) Power supply unit
(2) Fan
(3) 230 V power in ((6) --> connector for the 230V in power supply unit)
(4) Power supply 24 V output for LCU
(5) 230 V AC input for power supply unit

4.3.2 LCU (LED Control Unit)

The LCU (LED control unit) board controls all functions of the HPLL module.

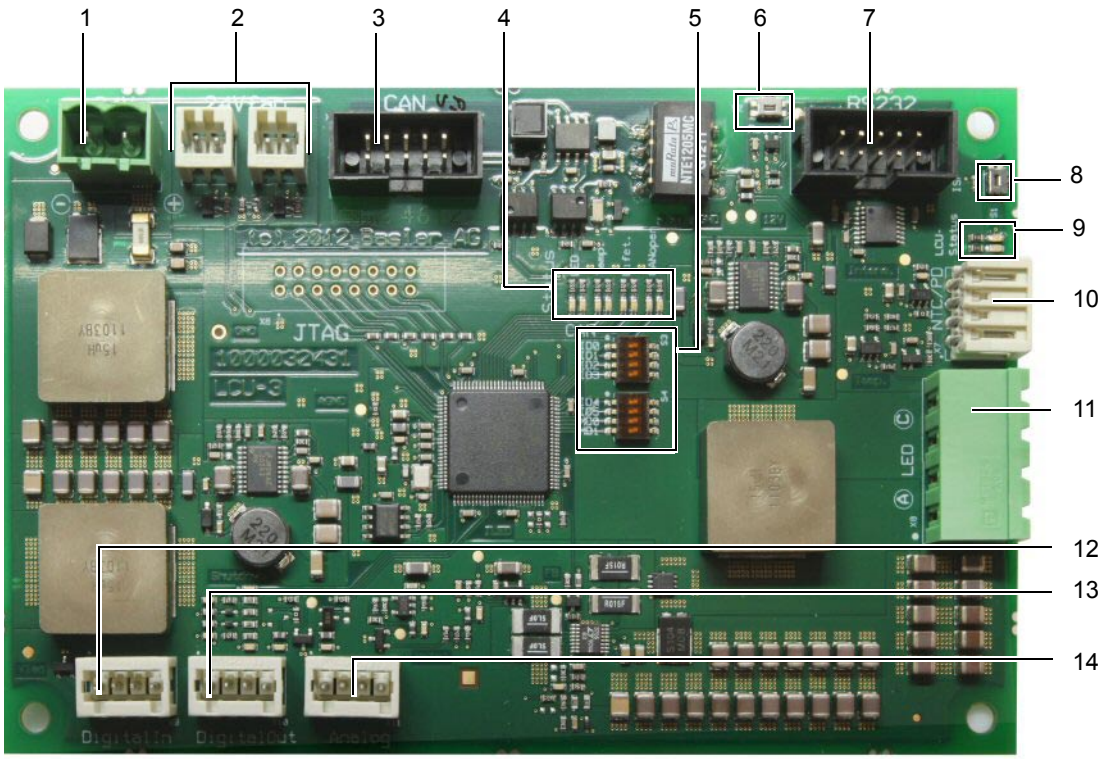


Fig. 11: LCU (LED Control Unit)

(1) 24 V Power in (supplied by the power supply unit)
(2) 24 V DC for housing fan (left: X2) and Light Engine fan (right: X3)
(3) CAN bus connector
(4) Status LEDs; from left to right (LED, temperature, operating hours, CAN open)
(5) DIP switches for setting the CAN node ID
(6) Reset button: used
- if temperature error occurred or
- if a reset is required due to an LCU error or
- if a LCU firmware upgrade is realized.

(7) RS 232 connector (only used for changing firmware)
(8) ISP (for programming; internal use)
(9) LCU status LEDs
(10) Connector for temperature sensor and intensity control (X7)
(11) Connector for LED (X8)
(12) X9: Digital inputs
(13) X10: Digital outputs (not used)
(14) X11: Analog output 0-10V, (not used)

4.3.3 Fuses and Connectors

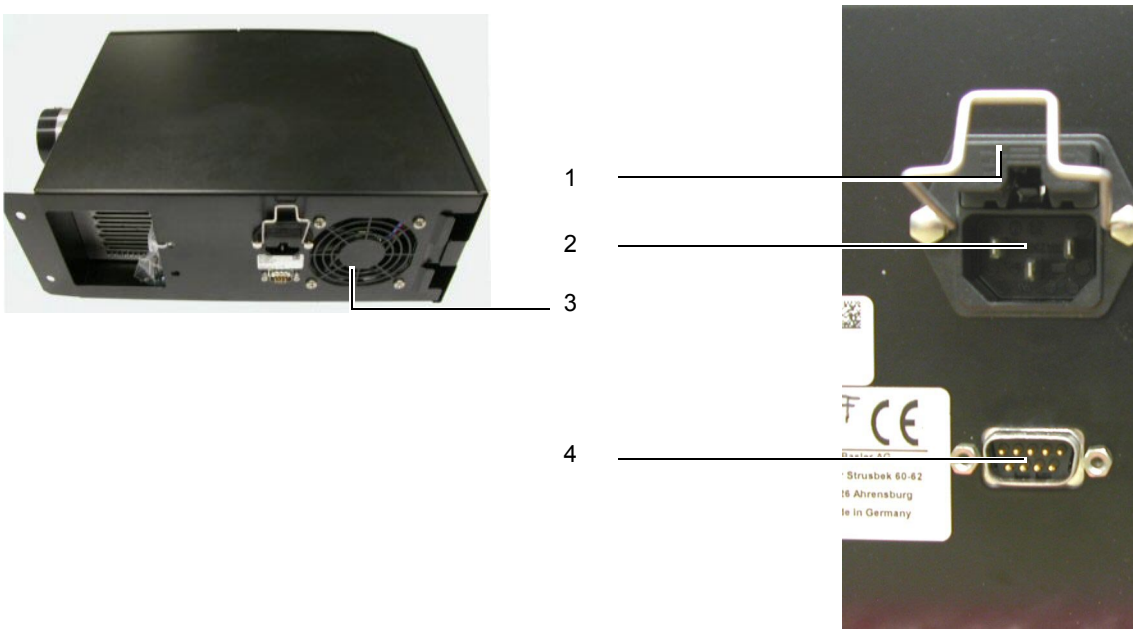


Fig. 12: Fans, Fuses and Connectors

(1) Melting fuses 2.5 A (2 x), slow blowing.

(2) Mains supply connection.

(3) Ventilation grille for fan inside the housing. The housing fan runs only while the HPLL module is switched on.

(4) CAN bus socket (not terminated).

4.3.4 Status LED

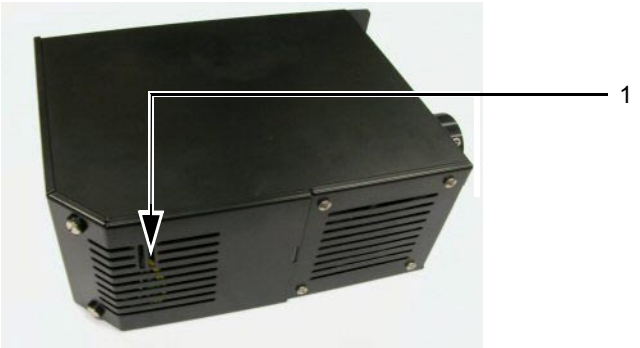


Fig. 13: HPLL Status LED

(1) HPLL status LED

The HPLL status LED can show the following colors:

- **Green**: HPLL module is switched on and operative.
- **Red**: error status (e.g. operating time error, temperature error)
- **Deactivated**: The HPLL module is switched off.

For information on error conditions, see Section 10.2.2 on page 66.

4.4 Temperature Sensor

To protect the HPLL module from damage by overheating, the LED module is equipped with a resistor serving as a temperature sensor. The temperature sensor is located on the LED device.

Once the temperature of the sensor exceeds 72° C, the sensor triggers the following actions:

- the status LED on the HPLL module turns red (see 4.3.4 on page 20)
- the respective HPLL module is switched off,
- an error message is sent via CAN bus,
- an error message is displayed in **Event Log Viewer**.

The sensor’s trigger threshold of 72° C is defined in the firmware of the LCU or can be defined by changing the associated parameter for the temperature threshold in the machine parameter set.

4.5 Fans

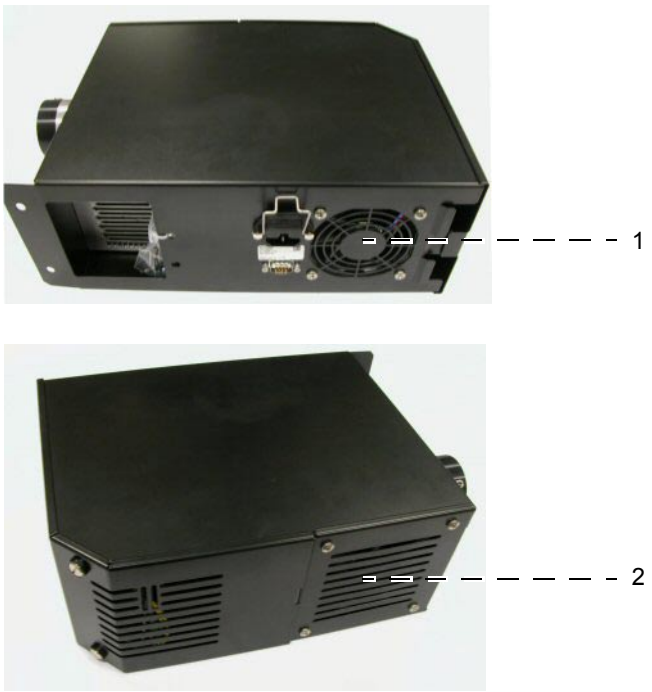


Fig. 14: Fans

Fig. 14: Each HPLL module is equipped with two fans. They direct the warm air flow from the power and control unit (LCU inclusive) and the Light Engine into the power distribution and mounting unit (lamp box).

The housing fan (**1**) cools the following components:

- the LCU,
- the power supply unit.

The Light Engine fan (**2**) cools the components in the Light Engine (e.g. LED).

Both fans only run when the HPLL power cable is connected to the power line.

4.6 Intensity Sensor

For intensity measurement the HPLL module is equipped with a photo diode as an intensity sensor.

The intensity control is monitored via CAN bus. The parameters for the intensity control are stored inside the HPLL module. They are set in the machine parameter set of the **Line Scan Controller** and are written into the HPLL module, each time **Line Scan Controller** is started.

4.7 Power Distribution and Mounting Unit (Lamp Box)

HPLL modules are mounted to a power distribution and mounting unit ("lamp box" for short). Depending on the system one of the following types of lamp boxes is integrated:

- **Vertical lamp box**: Vertical mounting of the lamp box and illumination modules.
  The illumination modules are arranged vertically, i.e. one above the other in the lamp box.
- **Horizontal lamp box**: Horizontal mounting of the lamp box and illumination modules.
  The illumination modules are arranged horizontally, i.e. side by side in the lamp box.

Several illumination modules are grouped to generate light. Number of modules and design of the unit vary depending on the inspection system.

The light is guided via optical fibers to the illumination bar in the sensor unit that illuminates the scan line on the substrate.

Each power distribution and mounting unit has a separate main switch to connect or disconnect power to the unit.

4.7.1 Mounting Sub-Unit

The illumination modules are fastened on the mounting sub-unit.

4.7.2 Power Distribution Sub-Unit

The illumination modules are connected to the power distribution unit of the lamp box.

Fig. 15: In the power distribution unit of the illumination unit, you find the cabling for power distribution to the illumination modules.

For detailed information, see the electric service documentation.

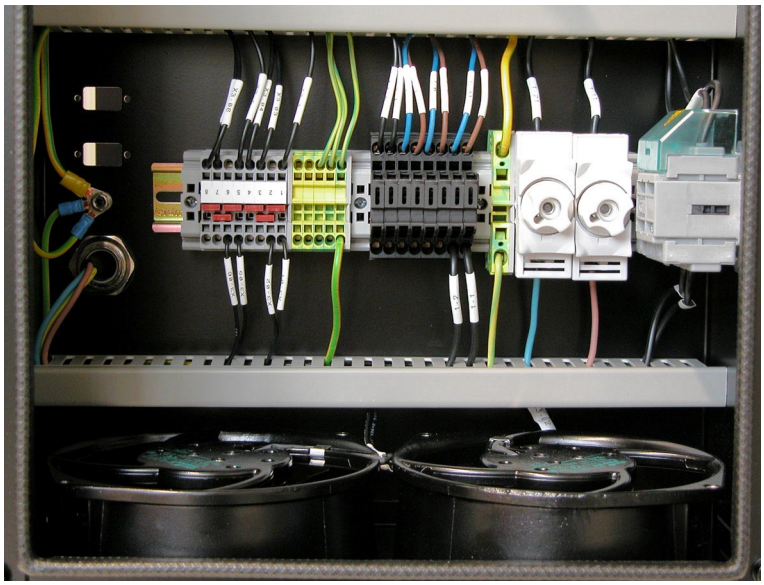


Fig. 15: Cabling (Example)

5 Parameter Settings

For information on the parameter settings in the Basler SENSIC software, see the Basler SENSIC service manual.

For information on how to set LCU parameters by using CAN messages, see section "Service" on page 33.

6 Initial Start Up

Caution

Before the initial start up make sure that you have realized the step described in "Preparing the HPLL Module for Operation" on page 9.

At this stage, the illumination module is not yet installed in the power distribution and mounting unit of the sensor unit (lamp box). Proceed as follows when installing the illumination module in the lamp box for the first time:

Fig. 16: Illumination Module

Caution

Do not touch the connector and the surface of the optical parts inside when the fiber connector is disconnected because the connector and the optical parts could get dirty and you could damage them.

To start up the illumination module:

1. Open the illumination module by unlocking the fastening screws [(A) in Fig. 16] at the front side of the illumination module.
2. Pull out the lid in the direction indicated by the arrow B in Fig. 16.

3. On the LCU, select CAN basic address with the DIP switch [(**1**) in Fig. 17]. The node ID is set with the corresponding DIP switch. The hexadecimal values for the individual switches are: **01 h, 02 h, 04 h, 08 h, 10 h, 20 h** from the top side to the bottom side.
   The value of the CAN node ID in the software is: setting at the DIP switch + 40h.

   The CAN node IDs are listed in the electrical documentation of the inspection system.
4. Close the HPLL module by remounting the lid and fastening it via the 2 screws [(A) in Fig. 16].
5. Close the lid of the illumination module.
6. Make sure the power switch of the lamp box is switched off.
7. Open the servicing lid of the lamp box.

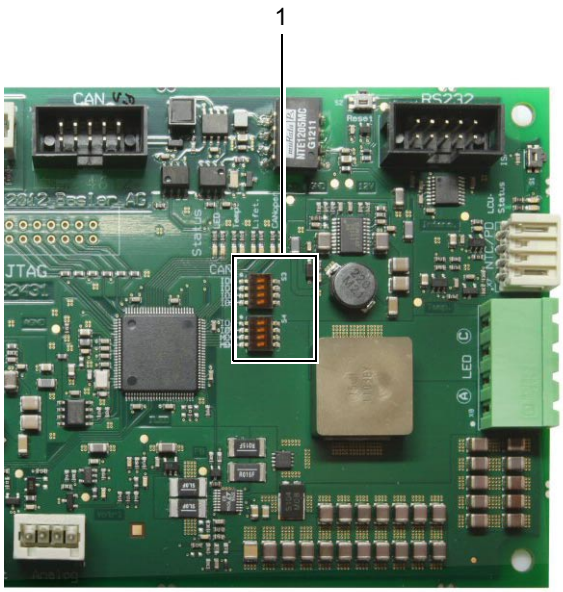


Fig. 17: DIP Switches on LCU

STOP	**Danger** To avoid injury to persons and damage to the HPLL module, make sure that you are two persons when mounting the HPLL module: One person must hold the HPLL module while the other person tighten the screws of the HPLL module. If you do not take these precautions, the HPLL module • can fall down and hurt you, and • can be damaged.

8. Depending on whether you replace an HQI or HPLL module select one of the following steps [a) or b)].
   a. If an HQI module is replaced by an HPLL module:
      Mount the devices (fasteners and screws) in the lamp box.
      The fasteners and screws are delivered in a plastic bag with the HPLL spare part.
      Insert the illumination module into the lamp box as indicated by the arrows in Fig. 18.
   b. If an HPLL module is replaced by an HPLL module:
      Insert the illumination module into the lamp box as indicated by the arrows in Fig. 18.
9. Fasten the illumination module with 2 screws [(1) in Fig. 18 indicates the holes].

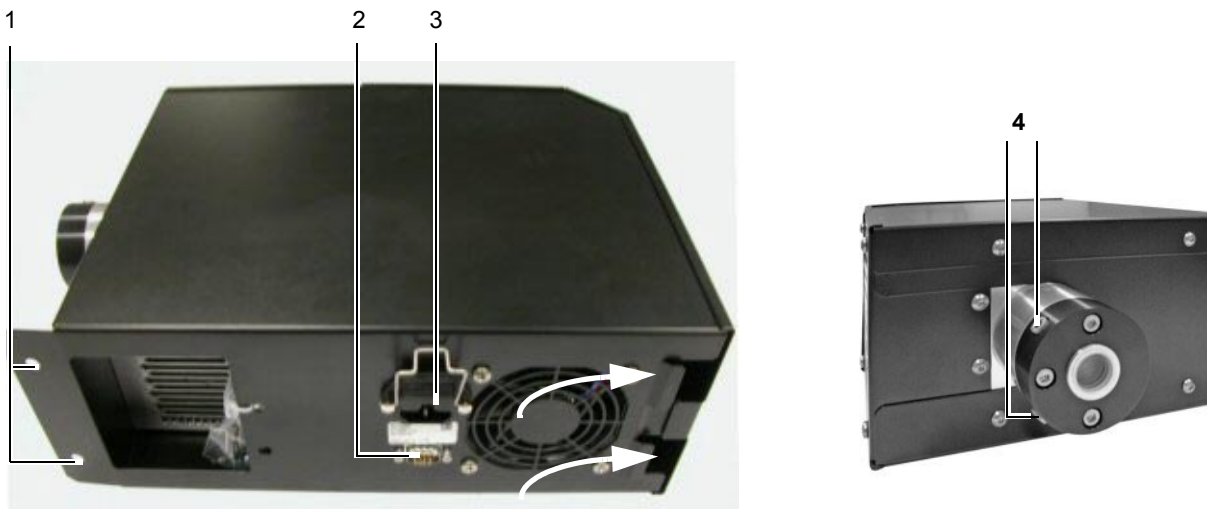


Fig. 18: HPLL Module

10. Plug the CAN bus connector of the lamp box [(2) in Fig. 18] to the respective bushes of the illumination module (refer to the electric circuit diagram).
11. Connect the inlet connector for non-heating apparatus of the lamp housing [(3) in Fig. 18] to the respective bushes of the illumination module (refer to the electric circuit diagram).
12. Close the safety catch.
13. Close the servicing lid of the lamp box.
14. Connect the CAN bus cables to the respective sockets of the lamp box. Alternatively, you can connect one CAN bus cable and a terminating resistor.
15. Carefully connect the fiber cable to the connector.
16. Fasten the screws [(4) in Fig. 18] at the side so that the fiber cable is fixed.
17. Realize steps 1 - 16 for all modules you want to mount.
18. Switch the main switch of the lamp housing on.
    Result:
    - The illumination modules go into pre-operational mode.
    - Both fans of each illumination module are running.
    - The LEDs of the HPLL modules are still off.

7 Operation

The illumination module has two operation modes:

- pre-operational mode after being switched on, i.e. both fans are running (see 1 and 2 in Fig. 19).
- operational mode. When **Line Scan Controller** is started, it automatically switches all connected illumination modules into operational mode. In the pre-operational state parameters can be set via CAN bus, but the light can't be switched on.

In the pre-operational mode, only SDO communication is possible.

In operational mode SDO, as well as PDO (process data objects) communication are possible. PDOs are required for controlling the HPLL (see Section 10.3.3 on page 72) and the status LEDs (see Section 10.1.2 on page 61).

During operation you only have to check the status LED regularly and, in case the LED indicates an error, rectify as described in Section 10 on page 59.

Fig. 19: Fans

8 Service

Normally, you carry out all parameter settings in the machine parameter set in **Parameter Set Manager**. For special case you have to modify parameter settings by sending CAN messages from your notebook.

8.1 Sending CAN Bus Messages from a Notebook

To send CAN bus messages from your notebook PC to the illumination module, you may use the USB-CAN Bus Adaptor in combination with the **PCAN View** software.

To establish communication between your notebook PC and the illumination module, proceed as follows.

To establish communication:

1. Disconnect the CAN bus cable from the illumination module.
2. Connect a USB CAN bus adaptor with another CAN bus cable to the illumination unit. Alternatively, remove one of the terminators from the CAN bus and connect the USB CAN bus adaptor instead.
3. Send and receive CAN messages using the **PCAN View** software.

8.2 Setting LCU Parameters by Using CAN Bus Messages

When you exchange the Light Engine in an HPLL illumination module, afterwards you have

- to reset the operating time counter of the LCU (see Section 8.2.1) and
- to send the new calibration factor(s) of the illumination module(s) via CAN message (see Section 8.2.2).

8.2.1 Resetting the Operating Time Counter of the LCU

To reset the operating time counter of the LCU:

Reset the operating time counter of LCU via the **PCAN View** software:

1. Open the **PCAN View** software.
2. Send the CAN message via the Basler net:

Identifier	Length	Data
600h + node ID	8	2F 00 52 04 01 00 00 00

3. Quit the **PCAN View** software.

8.2.2 Setting the Calibration Factors for the HPLL Illumination Modules

Note:

There are two kinds of HPLL modules:

- an HPLL module for **BF** (**bright field**) illumination and
- an HPLL module for **DF** (**dark field**) illumination.

The two kinds of HPLL illumination modules have a different configuration and emit different light intensities.

The configuration of the HPLL illumination modules is set at the Basler factory.

The two kinds of HPLL illumination modules must not be mixed within one illumination unit.

When installing a new Light Engine in your inspection system, the configuration factor of the corresponding HPLL module (BF or DF) must be set in the corresponding LCU.

To set the calibration factors for the HPLL illumination modules:

Set the calibration factors via the **PCAN View** software:

1. Refer to the leaflet sent with each Light Engine spare part / HPLL module. This leaflet contains two calibration factors: one for BF, one for DF.
   Make sure that you set the correct calibration factor in step 3.
2. Open the **PCAN View** software.

3. Send the CAN message via the Basler net:

Identifier	Length	Data
600h + node ID	8	2B 01 51 03 LB HB 00 00
LB = LowByte HB = HighByte The LB and HB values determine the calibration factor. The leaflet contains two values: one for BF, one for DF. Select the correct value and enter it.		

4. Save the settings by sending the following CAN message:

Identifier	Length	Data
600h + node ID	8	23 10 10 01 73 61 76 65

5. Quit the **PCAN View** software.

8.3 Displaying the Status of the HPLL Illumination Modules

For service purposes, you can open an **Illumination Control** window on the line scan station. In this window you can view the status of all installed illumination modules and control them individually or all together.

For a description of the **Illumination Control** window, see the Basler SENSIC service manual.

9 Maintenance and Repair

9.1 Safety

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

- Turn off and unplug system power before servicing.
- Use a lock-out device to prevent inadvertent power-on.

If work on the electric system with power switched on is required (e.g. resetting the operating time counter of the LCU), this work must **only be carried** out by a **skilled electrician** or by **specially instructed personnel**.

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

Danger

QUALIFICATION REQUIRED

To avoid injury, all maintenance must be performed by qualified technicians only.

9.2 Maintenance

The estimated life time of

- the Light Engine in an HPLL module is 30,000 hours.
- the HPLL module (without Light Engine) is 100,000 hours.

A warning **Operating Time** message is displayed after 30,000 operating hours of the HPLL module (e.g. in **Event Log Viewer**). This time is set by parameter. To guarantee an efficient operation of the entire system, the respective HPLL module should be replaced shortly after the **Operating Time** warning message.

Components that have to be replaced regularly are:

- Light Engine
- housing fan of the HPLL illumination module
- fans of the power distribution and mounting unit that holds the illumination modules

Observe the maintenance intervals listed in table 2.

Typical Rate	What to do	See...
every 30,000 operating hours	Replace the Light Engine.	Section 9.2.4 on page 46
every 70,000 operating hours (temperature below 40°C)	In the corresponding **HPLL module**, replace the housing fan.	Section 9.2.5 on page 48
every 35,000 operating hours (when operated at max. temperature) to 70,000 operating hours (room temperature)	In the **power distribution and mounting unit**, replace the fans.	Section 9.2.6 on page 49

Table 2: Maintenance Intervals

9.2.1 How to Remove the Illumination Module from the Lamp Box

When changing an illumination module, it is necessary to remove the respective illumination module from the power distribution and mounting unit (lamp box).

Depending on whether you still have an HQI illumination module or not, there are two possibilities:

- You want to remove an HQI illumination module, see 9.2.1.1 on page 40
- You want to remove an HPLL module, see 9.2.1.2 on page 43.

Note:

If you want to insert a new HPLL module, keep in mind that there are two kinds of HPLL modules:

- an HPLL module for **BF** (**bright field**) illumination and
- an HPLL module for **DF** (**dark field**) illumination.

The two kinds of HPLL illumination modules have a different configuration and emit different light intensities. The two kinds of HPLL illumination modules must not be mixed within one illumination unit.

Make sure that you select the correct module by checking the SAP number and the description on the module(s). This information is displayed on the type labels attached to the HPLL modules.

9.2.1.1 How to Remove an HQI Illumination Module

Danger

TOXIC MATERIAL

The HQI illumination module is equipped with metal halide lamps (HQI lamps) in which the discharge arc burns at high pressure in an atmosphere of halogen and mercury vapour and rare earths. The wattage of an HQI lamp is 150W. A 150W HQI lamp contains a maximum of 15 mg mercury. To avoid health risk in case of lamp breakage, observe the following safety instructions.

HEALTH RISK

Never inhale, swallow or get in skin contact with mercury or mercury compounds. Inhaling mercury or mercury compounds in vapour or powder form can lead to health problems. Mercury can also be absorbed through the skin.

Only operate the lamp, if the bulb is intact. If broken, intensive UV radiation will be released and damage your eye or skin.

PROTECTION AGAINST LAMP BREAKAGE

To avoid health risks, the manufacturer recommends the following procedure in the event of a lamp exploding or lamp breakage:

- Everyone in the immediate vicinity should leave the room as quickly as possible to avoid inhaling mercury vapour.
- The room should be carefully ventilated for 20 to 30 minutes at least.
- Once the luminaire has cooled down and certainly before it is used again, all residual mercury must be thoroughly removed from the inside of the luminaire.

  To avoid contact with the skin, use disposable gloves. Clear up liquid mercury using a cloth dampened with a commercial adsorption agent that contains a tenside.

FIRST AID

If you inhale, swallow or get in skin contact with mercury or mercury compounds, observe the following first aid measures:

- First aid personnel: Avoid contact with mercury or mercury compounds.
- After inhalation: Fresh air. If required, artificial respiration. Immediately consult a doctor.
- After skin contact: Wash the mercury off with much water. Remove contaminated clothes.
- After eye contact: Wash the mercury off while you keep your eyelid open (15 minutes). Immediately consult an eye specialist.
- After swallowing: If conscious, drink a lot of water, trigger a vomit. Immediately consult a doctor.

In case you want to remove an old HQI illumination module:

To remove an HQI illumination module:

STOP	**Danger** To avoid injury to persons and damage to the HQI illumination module, make sure that you are two persons when removing the HQI illumination module: One person must hold the HQI illumination module while the other person looses or tighten the screws of the HQI illumination module. If you do not take these precautions, the HQI illumination module • can fall down and hurt you, and • can be damaged.

1. Turn off and unplug system power.

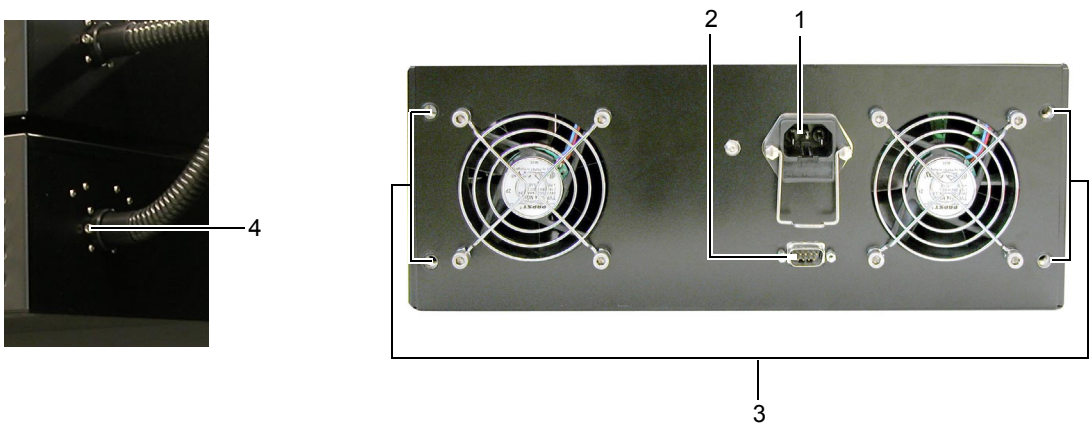


Fig. 20: Removal of HQI Illumination Module

2. Use a lock-out device to prevent inadvertent power-on.
3. Open the servicing lid of the lamp box.
4. Fig. 20**:** Open the safety catch and remove the mains supply cable from the mains socket (**1**).
5. Unscrew the fastening screws of the CAN bus cable and remove it from the CAN bus socket (2).
6. Unfasten the screw (4) holding the flexible fiber cable and remove the fiber cable from the connector.
7. Carefully place the fiber cable aside. Make sure that you do not touch the fibers and that the fiber cable does not fall down.

You must be two persons to realize the following step: One holding the illumination module to be removed, the other unscrews and removes the four mounting screws:

8. Unscrew and remove the four mounting screws (3).

9. Carefully take the illumination module out of the power distribution and mounting unit (lamp box) and position it carefully onto a solid support.
   Make sure that you select the correct module (BF or DF) by checking the SAP number on the module.

	Danger **DISPOSAL** To ensure a safe disposal of the lamps, observe your national regulations concerning mercury-containing waste. Do not allow mercury to pour into water, exhaust water or earth.

10. Set the calibration factor for the illumination module(s) [Light Engine(s)]:
    For information, see section 8.2.2 on page 34.

9.2.1.2 How to Remove an HPLL Module

In case you want to replace an HPLL module:

Note:

If you want to insert a new HPLL module, keep in mind that there are two kinds of HPLL modules:

- an HPLL module for **BF** (**bright field**) illumination and
- an HPLL module for **DF** (**dark field**) illumination.

The two kinds of HPLL illumination modules have a different configuration and emit different light intensities. The two kinds of HPLL illumination modules must not be mixed within one illumination unit.

Make sure that you select the correct module by checking the SAP number and the description on the module(s). This information is displayed on the type labels attached to the HPLL modules.

To remove an HPLL module:

Danger

To avoid injury to persons and damage to the HPLL module, make sure that you are two persons when removing the HPLL module: One person must hold the HPLL module while the other person looses or tighten the screws of the HPLL module.

If you do not take these precautions, the HPLL module

- can fall down and hurt you, and
- can be damaged.

1. Turn off and unplug system power.

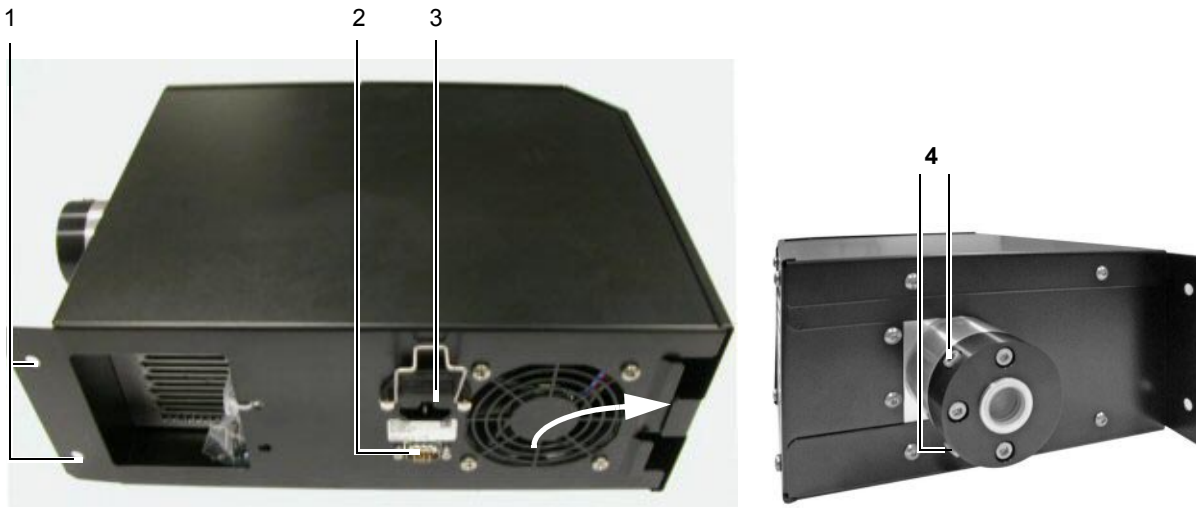


Fig. 21: Removal of HPLL Module

2. Use a lock-out device to prevent inadvertent power-on.
3. Fig. 21: Open the safety catch and remove the mains supply cable from the mains socket (3).
4. Unscrew the fastening screws of the CAN bus cable and remove it from the CAN bus socket (2).
5. Unfasten the screws (4) holding the flexible fiber cable and remove the fiber cable from the connector.
6. Carefully place the fiber cable aside. Make sure that you do not touch the fibers and that the fiber cable does not fall down.

You must be two persons to realize the following step: One holding the illumination module to be removed, the other unscrews and removes the four mounting screws:

7. Unscrew and remove the two mounting screws (1).

   The HPLL module is still inserted at the other end to the lamp box.
8. Carefully take the illumination module out of the power distribution and mounting unit by pulling the illumination unit in direction indicated by the arrow in Fig. 21.
9. Position the HPLL module carefully onto a solid support.
10. If you want to send it to Basler, make sure that you secure it for transportation.
    See "Preparing the HPLL Module for Transportation" on page 7.

9.2.2 How to Install the HPLL Module on the Lamp Box

To install the HPLL module:

You must be two persons to realize the following step: One holding the illumination module to be installed, the other handling the two mounting screws:

1. Make sure that you all safety devices for that you remove all safety devices that are installed it for transportation.

See "Preparing the HPLL Module for Operation" on page 9.

2. If an HQI module was mounted before:

   Mount the devices (fasteners and screws) in the lamp box.
   The fasteners and screws are delivered in a plastic bag with the HPLL spare part.
3. Insert the illumination module into the lamp box as indicated by the arrow in Fig. 22.
4. Carefully insert the illumination module into the power distribution and mounting unit (lamp box).
   Make sure that the tabs (see Fig. 22) are inserted in the recess provided for them on the lamp box device housing (i.e. after mounting the tabs must at the rear side of the lamp box housing so that they fix the module).
5. Fig. 22: Insert and fasten the two fastening screws (**1** indicate the holes for the screws).
6. Insert the CAN bus cable into the CAN bus socket (**2**) and fasten the fastening screws.
7. Insert the mains supply cable into the mains socket (**3**) and fasten the safety catch.
8. To mount the fiber bundle hose:

   a.Carefully connect the fiber cable to the connector.

   b.Fasten the screws (4) at the side so that the fiber cable is fixed.

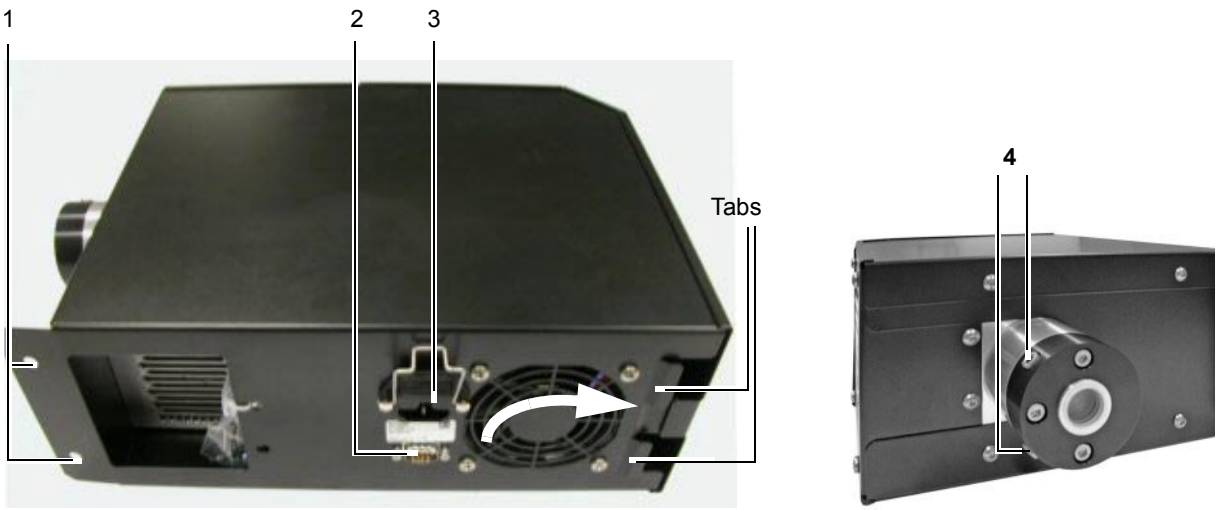


Fig. 22: Installing the HPLL Module

9.2.3 Operating Hours (Operating Time Error)

If the **Operating Time** warning after 25,000 operating hours of the LED (inside the Light Engine) is ignored and the Light Engine is not replaced, the error message **Operating Time** appears after 30,000 operating hours (e.g. **Event Log Viewer**). This indicates, that the LED now definitely has to be replaced. Otherwise there will be an error due to LED failure and the correct intensity of the illumination is not guaranteed any more.

To remedy operating time error:

1. Change the Light Engine as described in Section 9.2.4 on page 46.

9.2.4 How to Replace the Light Engine

Danger

BRIGHT LIGHT

- The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.
- Never remove the fiber connector while the HPLL module is under power. The LED emits bright light which can be harmful to your eyes. You could become blind.

To replace the Light Engine:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Turn off and unplug system power before servicing.
2. Use a lock-out device to prevent inadvertent power-on.

   Repeat the below procedure for every Light Engine you need to replace.
3. Unfasten the screws (4) holding the flexible fiber cable and remove the fiber cable from the connector.
4. Carefully place the fiber cable aside. Make sure that you do not touch the fibers and that the fiber cable does not fall down.

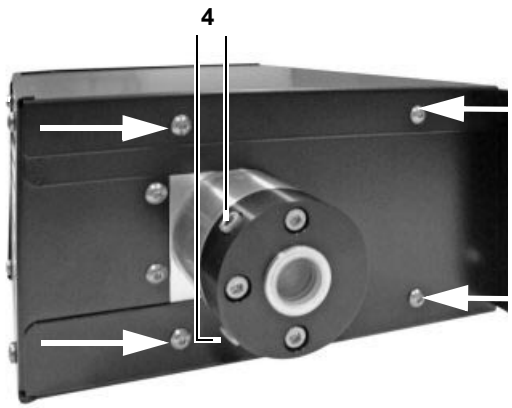


Fig. 23: Screws on Light Engine

5. Remove the lid of the illumination module (see Fig. 24):
   a. Unfasten the two screws, (A) in Fig. 24.
   b. Pull out the lid in the direction indicated by the arrow B in Fig. 24.
6. Remove the three LCU connectors that are connected to the Light Engine (LED, sensors, Fan)
7. Unfasten the four screws on the Light Engine side the positions of which are indicated in Fig. 23.
8. Carefully pull the Light Engine out of the HPLL module.
9. Carefully position the new Light Engine.
10. Fasten the four screws on the Light Engine side the positions of which are indicated in Fig. 23.
11. Connect the LCU cables connecting the LCU and the Light Engine.
12. Carefully remount the flexible fiber cable.
13. Fasten the flexible fiber cable via the screws (4 indicated in Fig. 23).

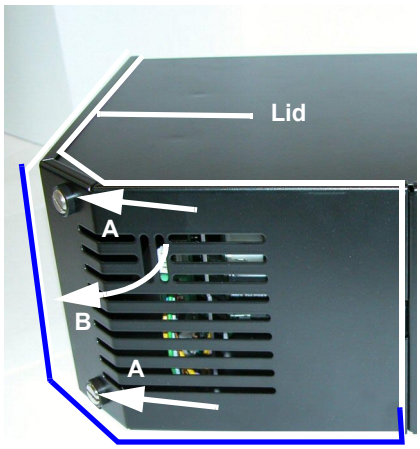


Fig. 24: Lid of HPLL Module

Danger

HIGH VOLTAGE

Danger of electric shock. Do not touch electronic boards. Parts of the electronic boards are under high voltage.

14. Close the lid of each illumination module and fasten the two screws (see A in Fig. 24).
15. Reset the operating hours for the new LED back to zero via the **PCAN View** software:
    Depending on whether you exchanged the Light Engine of a bright field or dark field illumination unit, realize the reset on the corresponding IPC (LSC0x).
    For more information, see section 10.1.2.1 on page 63 and section 8.2.1 on page 34.
16. Set the calibration factor for the HPLL module (Light Engine):
    For information, see section 8.2.2 on page 34.

Note

Set the calibration factor value in the LCU **depending on whether** you install a bright field or dark field illumination module.

The calibration factor values are enclosed in the Light Engine spare part package.

9.2.5 How to Replace the Housing Fan of the HPLL Module

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.
You could become blind.

To replace the housing fan:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Turn off and unplug system power before servicing.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the lid of the illumination module (see Fig. 25):
   a. Unfasten the two screws, (A) in Fig. 25.
   b. Pull out the lid in the direction indicated by the arrow B in Fig. 25.

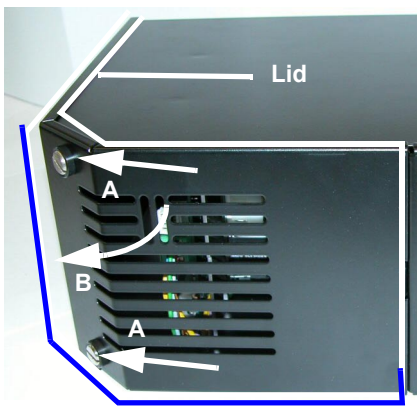


Fig. 25: Lid of HPLL Module

4. Disconnect the fan cable plug from the LCU (see Fig. 26).

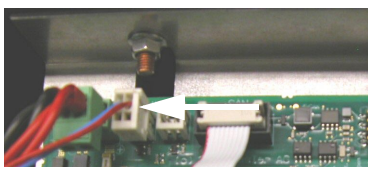


Fig. 26: Fan Cable Plug

5. Unscrew the screws indicated in Fig. 27.
6. Take out the fan and insert the new one.

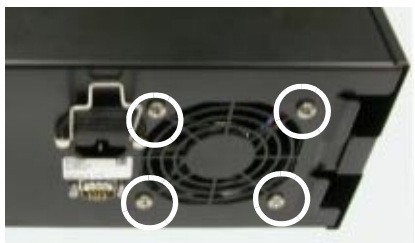


Fig. 27: Screws for Fixing the Fan

7. Connect the fan cable to the X2 connector (see Fig. 26).
8. Remount the lid of the illumination module.
9. Fasten the two screws (see A in Fig. 25).
10. Turn the power on.
11. Check that the fans are working (i.e. turning).
12. Close the servicing lid of the power distribution and mounting unit.

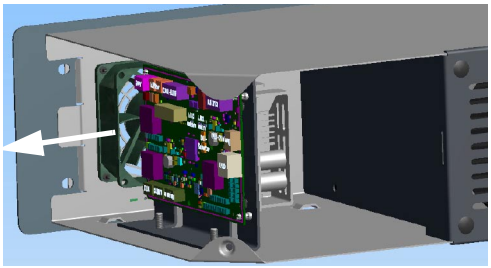


Fig. 28: Pulling Out the Housing Fan

9.2.6 How to Replace a Fan in the Lamp Box

Fans are located inside the power distribution and mounting unit (lamp box). Their number depends on the number of HPLL modules installed in the system.

To replace a fan:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Turn off and unplug system power before servicing.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the servicing lid.
4. Remove the covers from the cable ducts.
5. Disconnect the corresponding wires from their clamps (refer to the circuit diagram).
6. Dismount the fan you want to change.
7. Mount the new fan. In some cases it may become necessary to lengthen the wires to the fan (refer to the circuit diagram for the correct extension wire).
8. Connect the wires to the corresponding clamps.
9. Install the covers of the cable ducts.
10. Close the servicing lid.
11. Reconnect system power and switch on power to the power distribution and mounting unit.
12. Check that the fans are working (i.e. turning).

9.2.7 How to Upgrade the Firmware

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on. You could become blind.

To upgrade the firmware:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

Note:

This procedure should only be carried out by qualified staff.

Only carry out this procedure, if LCU problems occur (e.g. CAN bus communication).

1. Turn off power and unplug the system from the mains before servicing.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the lid of the HPLL illumination module (see Fig. 29):
   a. Unfasten the two screws, (A) in Fig. 29.
   b. Pull out the lid in the direction indicated by the arrow B in Fig. 29.

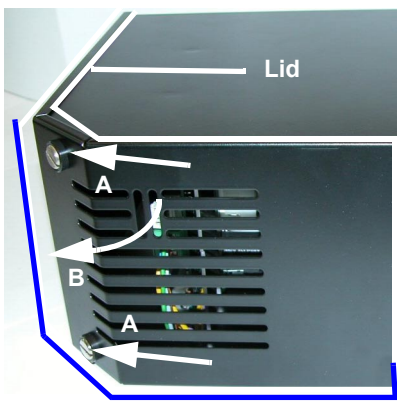


Fig. 29: Lid of HPLL Illumination Module

4. You need a programming cable with a 10-pin header connector at one end and a D-Sub 9-pin connector at the other end (see Fig. 30).

   Do **not use** a USB-to-RS-232 converter; it might not work. Use a true USB-to-RS-232 interface.
5. Plug the 10-pin IDC female header connector into the RS-232 port (see Fig. 31).
6. Plug the D-Sub 9-pin connector of the programming cable into one end of a RS232 cable.
7. Plug the other end of the RS232 cable into your computer.
8. Follow these steps to put the LCU into programming mode:

   a. Make sure that there is no residual current left in the LCU.

   b. Press the ISP button and keep it pressed (see Fig. 31).

   c. Connect a 24 V power source to the LCU.

   d. Let go of the ISP button.

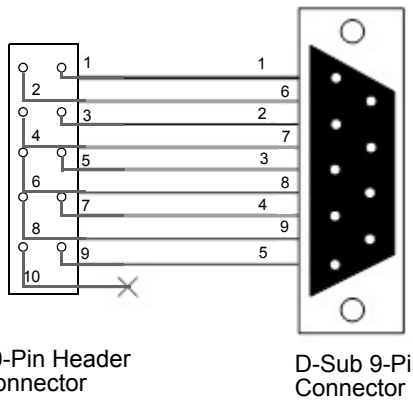


Fig. 30: Programming Adaptor with 10-Pin Female Connector and D-Sub 9-Pin Connector

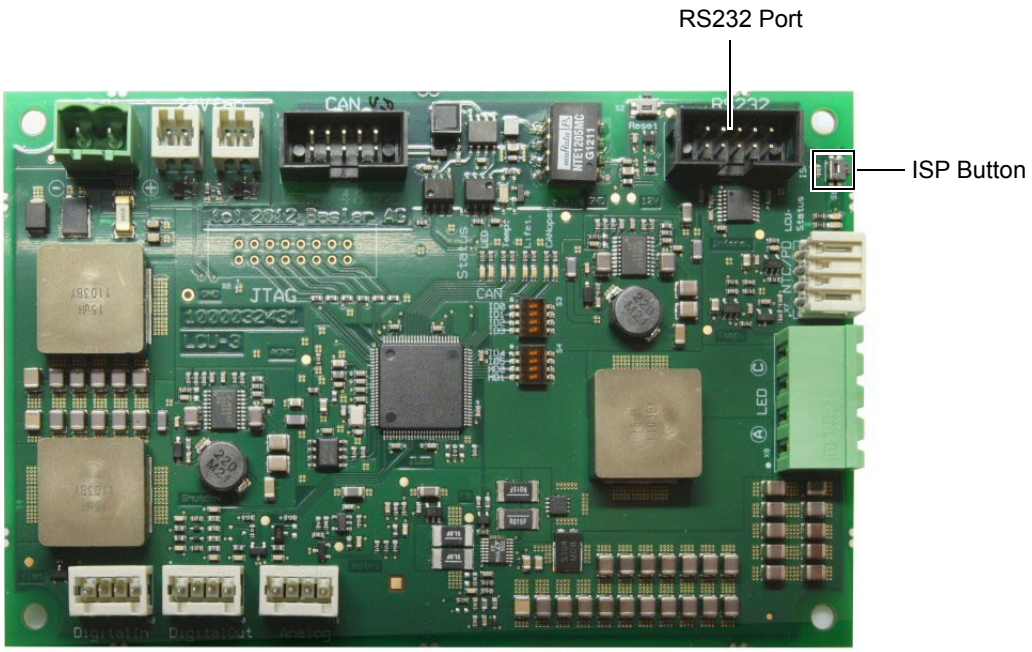


Fig. 31: LCU

9. Turn on the illumination module.

10. The LCU is programmed using the **FlashMagic.exe** tool. This tool can be downloaded from www.flashmagictool.com.

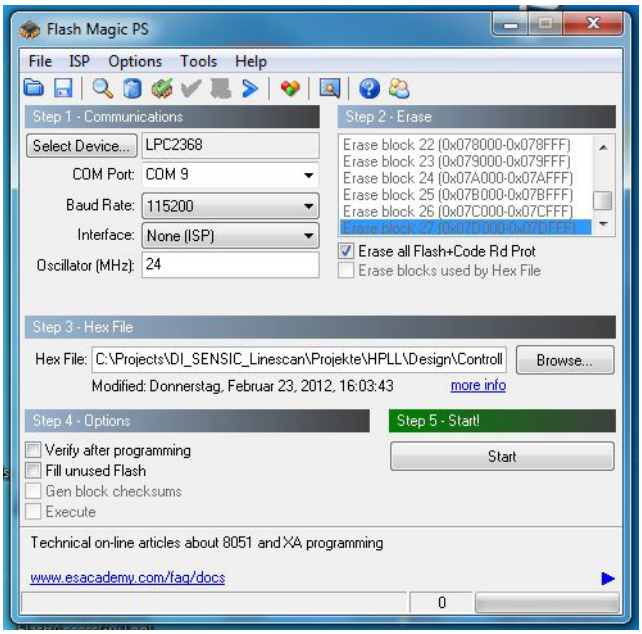


Fig. 32: Flash Magic Dialog Box

11. Install the **FlashMagic** software.
12. Start the **FlashMagic** software.
13. Under **Step 1 - Communications**, check the following settings:
    a. **Select Device** - This must be set to **LPC2368**.
    b. **COM Port** - If required, adjust the COM port.
    c. **Baud Rate** - Set the required baud rate.
    d. **Interface** - This must be set to **None (ISP)**.
    e. **Oscillator (MHz)** - This must be set to **24**.
14. Under **Step 3 - Hex File**, click **Browse** to load the LCU hex file.
15. Under **Step 4 - Options**, leave the options **Verify after programming** and **Fill unused Flash** unchecked.
16. Start the programming process by pressing the **Start** button.
17. A message will inform you when the upgrade has been completed.
18. Remove the RS232 cable.
19. Turn off the illumination module.
20. Close the lid of the illumination module.
21. Turn on the illumination module.

9.3 Repair

Vital components may break down after extensive operation. The following sections describe how to replace these components.

Note:

REPAIRS AT BASLER FACTORY ONLY

The following instructions are for Basler Technical Service only.

All **repair work must be done at Basler factory only**. Do not start repair at your factory. Your warranty may become void.

9.3.1 How to Replace the Power Supply Unit

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on.

To replace the power supply unit:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Realize the steps described under "How to Remove an HPLL Module" on page 43.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the lid of the illumination module (see Fig. 33):
   a. Unfasten the two screws, (A) in Fig. 33.
   b. Pull out the lid in the direction indicated by the arrow B in Fig. 33.
4. Disconnect and unfasten all plugs connected to the LCU and the power supply unit.

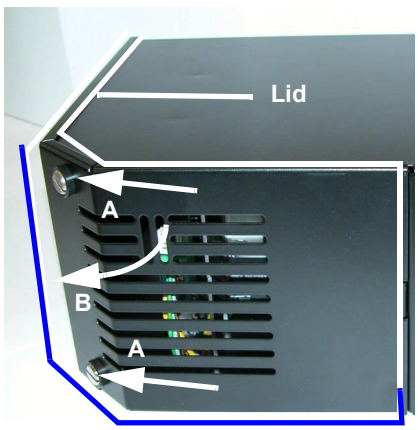


Fig. 33: Lid of HPLL Module

5. Unscrew the four nuts which fasten the supply and control unit to the illumination module housing, see arrows in Fig. 34.
6. Remove the complete plate (with LCU and supply unit) out of the illumination module.
7. Remove the old power supply unit from its mounting plate.
8. Attach the new power supply unit to the mounting plate.
9. Insert the new power supply unit into the illumination module.
10. Fasten the four nuts, see Fig. 34.
11. Connect all plugs you have loosened before to the new power supply unit and to the LCU.

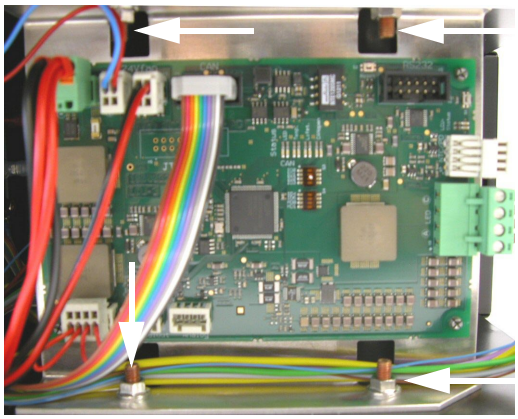


Fig. 34: Screws for (Un-)Fastening the Supply and Control Unit

12. Realize the steps described under "How to Install the HPLL Module on the Lamp Box" on page 44.
13. Close the servicing lid of the lamp box.
14. Reconnect and turn on system power.

9.3.2 How to Replace the LCU

The LCU is shown in Fig. 36.

Danger

BRIGHT LIGHT

The LED emits bright light which can be harmful to your eyes. Never look into the light. Never open the illumination module while the light is still switched on. You could become blind.

To replace the LCU:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Realize the steps described under "How to Remove an HPLL Module" on page 43.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the lid of the illumination module (see Fig. 35):
   a. Unfasten the wo screws, (A) in Fig. 35.
   b. Pull out the lid in the direction indicated by the arrow B in Fig. 35.
4. Fig. 36: Disconnect all plugs from the LCU mounting.

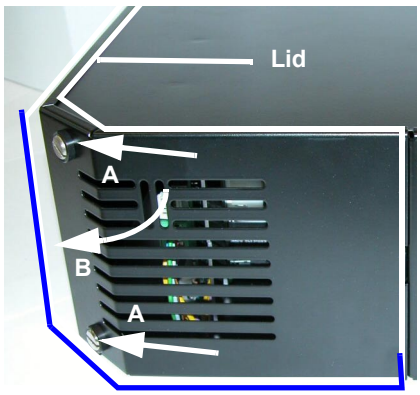


Fig. 35: Lid of HPLL Module

5. Carefully pull the LCU board from the carrier plate as indicated in Fig. 36.
6. Carefully insert the new LCU board.
7. Make sure that the DIP switch settings of the new LCU are the same as for the old LCU (identical CAN Node ID).
8. Connect all cables to the new LCU. Refer to the circuit diagram for correct assignment.
9. Insert the lid and fasten the two screws.
10. Close the servicing lid of the lamp box.
11. Reconnect and turn on system power.

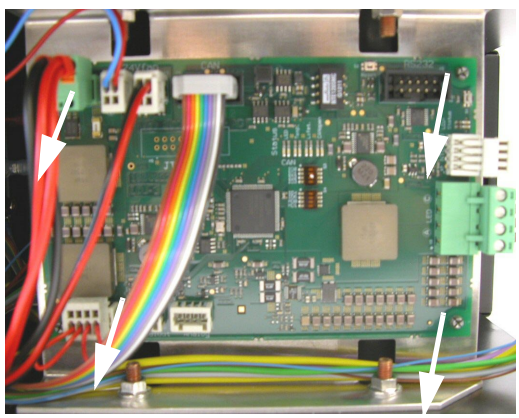


Fig. 36: Replacing the LCU

9.3.3 How to Replace a Fuse of the Illumination Module

The illumination module's 2.5 A slow blowing melting fuses are located in a fuse holder (**1**) close to the mains supply connector.

To replace a blown fuse:

Danger

HAZARDOUS VOLTAGE

Danger of electric shock.

1. Turn off and unplug system power.
2. Use a lock-out device to prevent inadvertent power-on.
3. Open the servicing lid of the lamp box.
4. Open the safety catch.
5. Disconnect the mains supply cable of the illumination module.
6. Open the fuse holder with the help of a screwdriver.
7. Replace the blown fuse.
8. Insert the fuse holder again.
9. Reconnect the mains supply cable.
10. Close the safety catch.
11. Fasten the servicing lid.
12. Reconnect and turn on system power.
13. Check whether the illumination module with the new fuse works correctly.

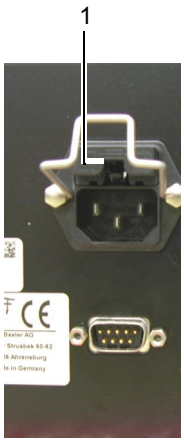


Fig. 37: Fuses

9.3.4 How to Replace a Fuse in the Lamp Box

The fuses of the power distribution and mounting unit (lamp box) are located inside the unit in the bottom area above the outlet fans.

To replace a fuse:

Danger

HAZARDOUS VOLTAGE

Fuse holders remain under power even if the main switch is in OFF position. Contact may cause death, electric shock or burn.

1. Turn off and unplug system power.
2. Use a lock-out device to prevent inadvertent power-on.
3. Remove the servicing lid.
4. Replace the blown fuse.

Note:

Two types of fuses are applied in the power distribution and mounting unit (lamp box):

- D01 melting fuses to protect the internal wiring. They are located in front of the main switch.
- 5 x 20 mm melting fuses to protect sets of modules. They are located behind the main switch.

5. Close the servicing lid.
6. Reconnect and turn on system power.

9.3.5 How to Replace the Master Switch

The master switch is located in the power distribution and mounting unit (lamp box).

To replace the master switch:

Danger

HAZARDOUS VOLTAGE

Fuse holders remain under power even if the main switch is in OFF position. Contact may cause death, electric shock or burn.

1. Turn off and unplug system power.
2. Use a lock-out device to prevent inadvertent power-on.
3. Open the servicing lid of the lamp box.
4. Remove both D01 fuses. Refer to the circuit diagram in the appendix of this manual.
5. Make sure that no voltage is applied to a wire connected to the master switch and disconnect all wires from the master switch.
6. Remove the rotary handle of the master switch by unscrewing its fastening screw and tearing off the handle.
7. Unscrew and remove the four mounting screws of the master switch and remove it.
8. Install the new master switch and fasten the four mounting screws.
9. Fasten the rotary handle to the new switch.
10. Connect the wires to the new master switch as described in the electric circuit diagram.
11. Check whether the wiring is correct.
12. Cover the contacts with the blind.
13. Insert the D01 fuses again.
14. Close the servicing lid.
15. Reconnect and turn on system power.

10 Troubleshooting

10.1 How to Detect That an Error Occurred/ Is About to Occur

The operator recognizes warning and error states in two different ways:

- Event message in **Event Log Viewer** (see Section 10.1.1 on page 59)
- **Red status LED** on module (see Section 10.1.2 on page 61)

10.1.1 Event Log Viewer

Table 3 lists the events caused by the illumination modules. For critical, error and warning events, you can find actions.

ID	Description	Severity	Explanation	Action
1060	Light intensity too low on illumination module %1.	Alert	Intensity is lower than LIGHT_GROUP_ INTENSITY_ERROR_ THRESHOLD_MIN.	Check parameter settings.
1061	Light intensity too high on illumination module %1.	Error	Intensity is higher than LIGHT_GROUP_ INTENSITY_ERROR_ THRESHOLD_MAX.	Check parameter settings. Check intensity sensor.
1062	Temperature threshold %2 exceeded on illumination module %1.	Critical	Illumination module is overheating. Temperature is higher than LIGHT_GROUP_ TEMPERATURE_ THRESHOLD_MAX	See Section 10.2.2 on page 66.
1063	Operating time exceeded on illumination module %1. Current operation time: %2.	Warning	Lamp's operating hours reached the LIGHT_ GROUP_OPERATING_ TIME_WARNING_ THRESHOLD.	See Section 10.2.3 on page 67.

Table 3: Event Messages

ID	Description	Severity	Explanation	Action
1064	Operating time exceeded on illumination module %1. Current operation time: %2.	Error	Lamp's operating hours reached the LIGHT_ GROUP_OPERATING_ TIME_ERROR_ THRESHOLD.	See Section 10.2.3 on page 67.
1065	Illumination module %1 is not responding.	Alert	No communication between illumination module and **Line Scan Controller** via CAN bus is possible.	See Section 10.2.3 on page 67.

Table 3: Event Messages

10.1.2 Status LEDs

Note:

SPECIAL WORKS AT BASLER FACTORY ONLY

The following instructions are for Basler Technical Service only.

All **work must be done at Basler factory only**. The HPLL housing must only be opened when power is connected at Basler factory.

Your warranty may become void.

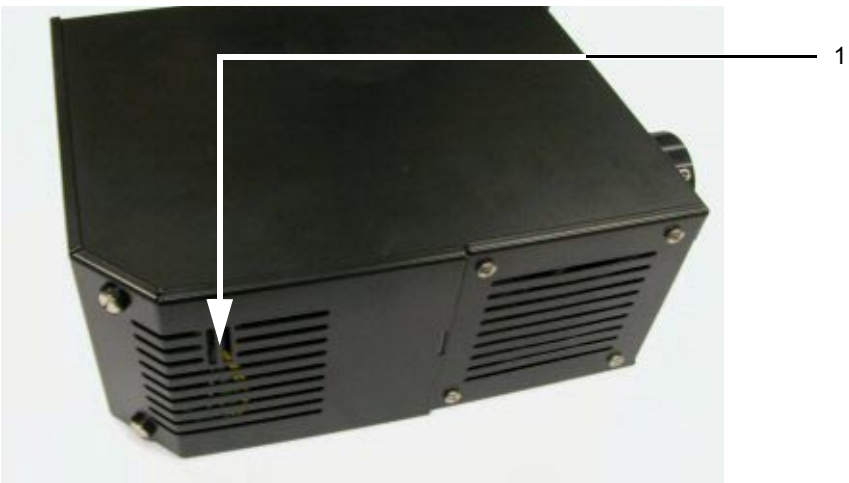


Fig. 38: HPLL 'Condensed Status" LEDs (Visible From the Outside)

(1) HPLL condensed status LEDs (D4 and D5 in Fig. 39 on page 62).

The HPLL status LED displays a condensed status of the different LEDs (on the LCU.

- A **green LED** signals that the status is OK.
- A **red LED** signals a critical condition.

If there is a red status LED and you are not sure what the reason is, you can

- either check the different status in the **Illumination control** dialog window or
- check the status of the single LEDs on the LCU.

For information on the single LEDs inside the housing, see the following pages.

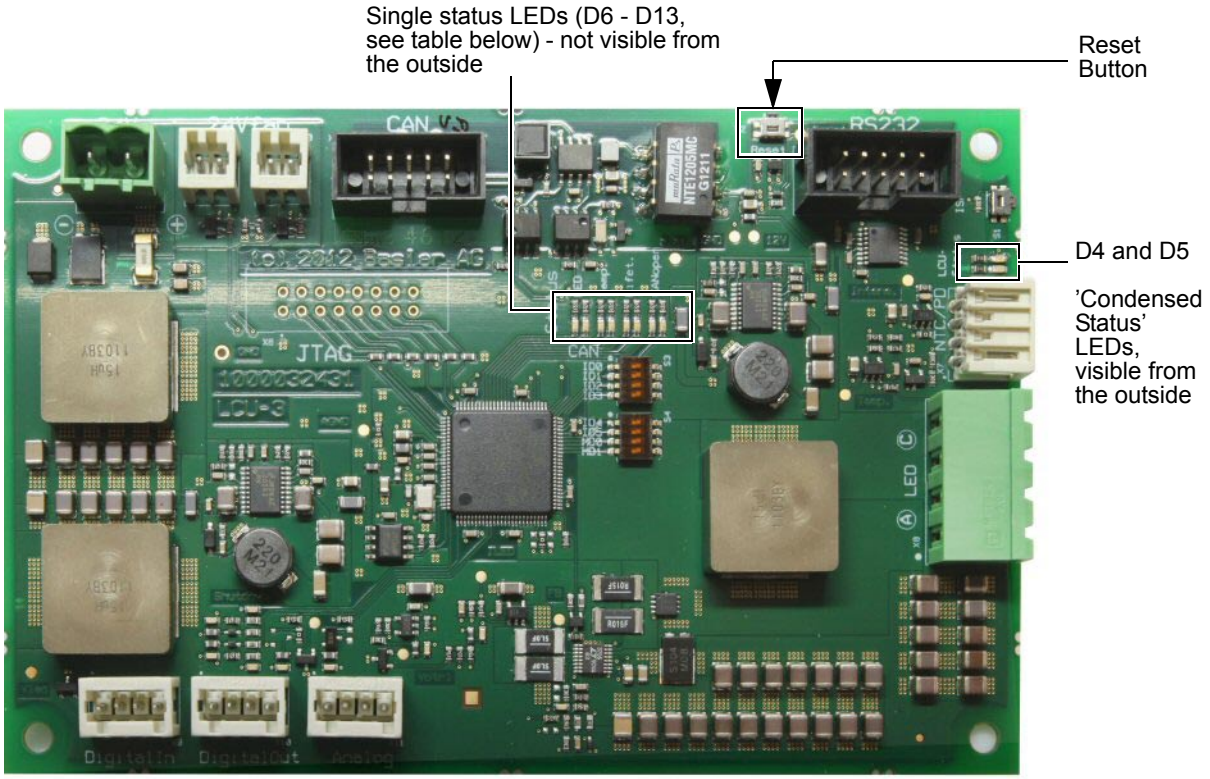


Fig. 39: LEDs on LCU (LED, Temperature, Operating Hours, CANopen)

LED	Function	Color	Off	On	Blinking
D4	LCU 'condensed status'	Red	-	Exceeded threshold	Threshold exceeding not acknowledged yet
D5		Green	-		Warning: Exceeded threshold
D6	Intensity control	Red	-	Exceeded threshold	-
D7		Green	High Power LED out	LED on	Control loop not in tolerance range
D8	Temperature	Red	-	Exceeded threshold	Threshold exceeding not acknowledged
D9		Green	-	ok	-

Table 4: Status LEDs on the LCU

LED	Function	Color	Off	On	Blinking
D10	Operating hours (lifetime)	Red	-	Alarm: Exceeded threshold --> Replace Light Engine immediately. See Section 9.2.4 on page 46.	-
D11		Green	-	ok	Warning: Exceeded threshold --> Replace Light Engine in the near future. See Section 9.2.4 on page 46.
D12	CAN error	Red	on	Bus off	-
D13	CAN Run	Green	LCU off	Operational	Pre-operational

Table 4: Status LEDs on the LCU

10.1.2.1 Operating Hours

LED	Status	Action
Red	LED operating hours have reached error threshold of 30,000 hours.	Replace Light Engine immediately. See Section 9.2.4 on page 46.
Green, flashing	LED operating hours have reached warning threshold of 25,000 hours.	Warning: Exceeded threshold --> Replace Light Engine in the near future. See Section 9.2.4 on page 46.
Green	LED operating hours below warning threshold of 25,000 hoursl.	No action required.

Table 5: Indications of Operating Hours LED

For more information, see "Resetting the Operating Time Counter of the LCU" on page 34.

10.1.2.2 Temperature

To protect the illumination module from overheating, the illumination module is equipped with a temperature sensor close to the LED.

If an overheating condition is present, this sensor triggers a switch off of the LED in the Light Engine and sends error messages to the operator and the SENSIC application.

Additionally, the status LED on the HPLL module housing turns red. This status LED can indicate the following temperature conditions (Table 6).

LED	Status	Action
Red	Temperature level has become critical. Illumination module has switched off.	Refer to Section 10.2.2 on page 66.
Red, flashing	Temperature has been critical, but has cooled down by now.	Find out the cause for the temperature increase and rectify. Acknowledge that the illumination module is OK by pressing the status reset button.
Green	Temperature level OK.	No action required.

Table 6: Indications of Temperature LED

10.1.2.3 Intensity

LED	Status	Action
Red	Intensity **not** OK, i.e. intensity is either beyond the maximum or the minimum threshold parameter	Check whether the parameters in the Parameter Set Manager are correct.
Green	Intensity OK, i.e. intensity is within the threshold parameters defined in **Parameter Set Manager**	No action required.

Table 7: Indications of Intensity LED

10.2 LED of HPLL Module Switched Off

An LED in the Light Engine is switched off for the following reasons:

- the HPLL module is switched off
- Illumination Status 03 (Shutter Closed) (page 65)
- Overheating (Temperature Error) (page 66)
- LED of HPLL Module Cannot Be Switched On (page 68)

Check whether one of the above mentioned reasons applies.

10.2.1 Illumination Status 03 (Shutter Closed)

Certain tasks (e.g. media adaptation or intensity correction) demand several cycles with the illumination switched on and off.

An electronic shutter (i.e. the software) switches on/off the LED in the HPLL modules.

Due to downward compatibility reasons (i.e. other illumination types have a mechanical shutter) the switching on or off of the HPLL LED is treated in the software as ’shutter mode’.

Shutter Mode Status	HPLL Module	Illumination Type With Mechanical Shutter
Status 03	LED is switched off	Shutter closed
Status 01	LED is switched on	Shutter open

10.2.2 Overheating (Temperature Error)

If the temperature sensor switched off the LED (see Section 10.1.2.2 on page 64), proceed as follows.

	Note: **SPECIAL WORKS AT BASLER FACTORY ONLY** The following instructions are for Basler Technical Service only. All **work must be done at Basler factory only**. The HPLL housing must only be opened when power is connected at Basler factory. Your warranty may become void.

To remedy a temperature error:

1. Verify the following:
   - Check whether the room temperature is below 30°C. The room temperature must not exceed 30°C.
   - Check whether the value of the parameter for the maximum temperature is 72° C.

2. For the following points you have to open the HPLL module:
   The following points are valid for fan 1 and fan 2 (see Fig. 40):
   - Check for obstructions in the cooling air flow of the fan.
     Remove obstructions, if required.
   - Check whether the fan works properly.
     Replace the fan, if required.
3. You have to press the reset button on the LCU (see arrow in figure above), before you can restart it.

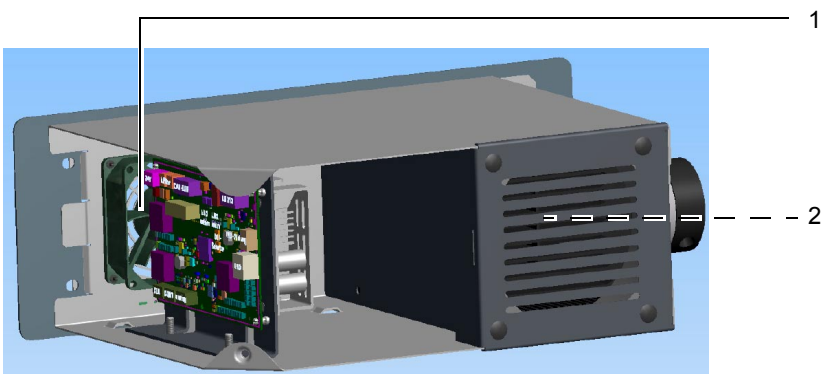


Fig. 40: Fans

10.2.3 HPLL Module Not Responding

If communication between illumination module and **Line Scan Controller** via CAN bus is not possible, check the following:

Check	Result	Action
Whether the following error message is displayed in the **Illumination Control** dialog box in **Line Scan Controller**: **Invalid operation mode**.	The HPLL modules switched off temporarily because of a short power blackout and then restarted in pre-operational mode.	1. Restart **Line Scan Controller** to bring the modules back into operational mode.
Whether status LED of the illumination module is off.	• Power supply of the illumination module is disconnected. • Fuse of the illumination module is blown. • Power supply is broken.	1. Reestablish power supply. 2. Restart **Line Scan Controller** (not mandatory). 1. Replace the fuse. 1. Replace the fuse.
Whether the CAN bus cable is connected properly. With the aid of the PeakCanView software, check whether CAN messages can be sent to the illumination module and whether the module is responding correctly.	CAN bus connection between line scan PC (IPC) and illumination module is disrupted.	1. Reestablish CAN bus connection. 2. Restart **Line Scan Controller** (not mandatory).
Which event messages occurred before illumination module(s) logged off. With the aid of the **PeakCanView** software, check whether CAN messages can be sent to the illumination module and whether the module is responding correctly.	Illumination module(s) logged off due to high bus load.	1. If applicable, remove causes for event messages. 2. Close **Line Scan Controller**. 3. Start the **PeakCanStat** software and, if applicable, close all CANLib objects. 4. Restart **Line Scan Controller**.
Check	**Result**	**Action**
-	HPLL module is defective.	1. Disconnect CAN bus connection of the potentially defective illumination module. 2. To avoid this problem from arising again, the defective illumination module must be replaced.

10.2.4 LED of HPLL Module Cannot Be Switched On

If the LED cannot be switched on, check the following:

Check	Result	Action
Temperature error has occurred and has not been reset.	• Status LED is red blinking. • Temperature error LED is red blinking.	1. Open the HPLL module and reset the status.
Cable bridge is broken.	LED is not switched on.	Plug in connector.

10.3 How to Set Parameters from a Notebook

Normally, you carry out all parameter settings in the machine parameter set in **Parameter Set Manager**. If one of the following problems occurs and you cannot find the reason, you should try to modify parameter settings by sending CAN messages from your notebook:

- Problems with intensity control
- Problems with CAN bus communication

See Section 8.1 on page 33 for general instructions on how to send CAN bus messages.

In Section 10.3.1 on page 69, you can find a list of the parameters that can be changed.

To calibrate the illumination module use a notebook PC.

10.3.1 Parameter Settings via CAN Bus

The following parameters can be set via CAN messages:

- Operating Time Warning (page 69)
- Operating Time Error (page 70)
- Temperature Error (page 70)
- Intensity (page 70)

To store or restore parameter changes, see Sections 10.3.1.4 on page 71 and 10.3.1.5 on page 71.

10.3.1.1 Operating Time Warning

The "operating time" warning message informs the operator that the estimated operating time of the LED of the HPLL module is about to expire. To grant a certain time window where the LED can be changed before it actually breaks down, the parameter value for "warning operating time" is shorter than the actual estimated operating time. Thus idle time due to unexpected breakdown of the LED can be kept to an absolute minimum.

Recommended warning parameter value = 61A8 (i.e. 25,000 h)

To define this parameter, enter the following message:

ID	Length	Message
600 + node ID	8	2B 00 52 02 LB HB 00 00

10.3.1.2 Operating Time Error

If the HPLL is not changed within a certain period of time after the "operating time" warning message was displayed, an operating time error message will occur. This message informs the operator that there will be an error due to brake down of the HPLL LED, if it is not immediately replaced.

Recommended error parameter value = 6D60 (i.e. 28,000 h)

To define this parameter, enter the following message:

ID	Length	Message
600 + node ID	8	2B 00 52 03 LB HB 00 00

For details on how to proceed when this error has occurred, refer to Section 10.2.3 on page 67.

10.3.1.3 Temperature Error

To protect the illumination module from overheating, a parameter for a trigger temperature of 72° C for the temperature sensor must be defined. When this critical temperature is reached, the temperature sensor triggers the following actions:

- The status LED turns red,
- the respective HPLL module is switched off,
- an error message is sent via the CAN bus,
- an error message is sent to the SENSIC application and displayed in **Event Log Viewer**.

To set the parameter for the temperature error message, enter the following message:

ID	Length	Message
600 + node ID	8	2F 00 60 02 02D02 00 00

The temperature is given in increments of 0.1° C.

For details on how to proceed when this error has occurred, refer to Section 10.2.2 on page 66.

3.3.5.1 Intensity

To set the parameters for the light intensity of the HPLL, send the following CAN messages:

ID	Length	Message
600 + node ID	8	2B 00 51 index LB HB 00 00

The following parameter values are defined by "index":

Index	Parameter values
2	Sets the intensity target value in integers
3	Sets the minimum threshold
4	Sets the maximum threshold
5	Sets the sampling time in milliseconds. Setting this parameter to "0" switches the closed loop control off. The parameter of index 2 is sent to the control output port
6	Starting time in seconds. When this period of time has elapsed, the closed loop control is started.
7	Linear term of the closed loop control
8	Integral term of the closed loop control
9	Cool down time of the illumination module in seconds. The illumination module cannot be restarted before the cool down time has elapsed

To return the parameter values given by the index, send this message:

ID	Length	Message
600 + node ID	8	40 00 51 index 00 00 00 00

10.3.1.4 How to Store Parameter Changes

Changes to the parameters are lost once the power is shut off. To save changes permanently, send the following message:

ID	Length	Message
600 + node ID	8	23 10 10 04 73 61 76 65

10.3.1.5 How to Restore Default Parameters

To undo changes to the parameters and to restore the default parameters, send the following message:

ID	Length	Message
600 + node ID	8	23 11 10 04 6C 6F 61 64

10.3.2 Boot Up Message

When the power is switched on, the LCU boots up in pre-operational mode. On booting up, the illumination module automatically returns the boot up message. The message below returns the status on request:

ID	Length	Message
600 + node ID	8	40 CO 02 10 00 00 00 00

10.3.3 HPLL Module and Shutter Control Using Process Data Objects (PDO)

In operational mode, the illumination module can be accessed via R-PD01 and T-PD01 for service purposes. Using R-PD01 you control the LED of the HPLL module with the following messages:

To switch LED on/off:

ID	Length	Message	Action
200 + node ID	1	01	switch on LED
200 + node ID	1	00	switch off LED
200 + node ID	1	03	set module into ’shutter closed’ status. This status is present for compatibility reasons. The LED is switched off.

To view status of the illumination module:

ID	Length	Message	Checkbox
180 + node ID	1	00	RTR

To switch between operational mode and pre-operational mode:

ID	Length	Message	Action
000 + node ID	2	01 node ID	switch to operational mode
000 + node ID	2	80 note ID	switch to pre-operational mode

Revision History

Document Number	Date	Changes
AW00118901000	22 Jun 2012	Initial preliminary release version of this manual.
AW00118902000	11 Dec 2012	Integrated new chapter "Preparing an HPLL Module for Transport and Operation" on page 7. Correction of typos. Replaced images: • Fig. 11 on page 18 (due to new LED layout -> added two new items in list) • Fig. 12 on page 19 • Fig. 13 on page 20 • Fig. 16 on page 27 (right image) • Fig. 17 on page 28 • Fig. 24 on page 47 • Fig. 25 on page 49 • Fig. 33 on page 53 • Fig. 34 on page 54 • Fig. 37 on page 56 • Fig. 38 on page 61 • Images on page 64 Inserted table 4 on page 62 (LCU status LEDs).

Table 8: Revision History

Document Number	Date	Changes

AW001189**03**000	1 Mar 2013	• Changed Basler mail addresses on the back of the front page.
		• Inserted "Danger of becoming blind!" note in section 1.6 on page 4
		• Updated section "LCU (LED Control Unit)" on page 18.
		• Inserted cross-reference note to section "Preparing an HPLL Module for Transport and Operation" in section "Initial Start Up" on page 27.
		• Updated section "Initial Start Up" on page 27 (photos inclusive).
		• Replaced images (due to HPLL modifications):
		  • Upper figure in Fig. 8 on page 15
		  • Fig. 12 on page 19
		  • Fig. 13 on page 20
		  • Fig. 14 on page 21
		  • Fig. 16 on page 27
		  • Fig. 18 on page 29
		  • Fig. 19 on page 31
		  • Fig. 21 on page 44
		  • Fig. 22 on page 45
		  • Fig. 23 on page 46
		  • Fig. 24 on page 47
		  • Fig. 25 on page 49
		  • Fig. 33 on page 53
		  • Fig. 34 on page 54
		  • Fig. 36 on page 55
		  • Fig. 38 on page 61
		• Integrated HQI safety instructions in section "How to Remove an HQI Illumination Module" on page 40.
		• Updated section "How to Replace the Light Engine" on page 46.
		• Integrated new section "How to Upgrade the Firmware" on page 50.

Table 8: Revision History

Document Number	Date	Changes

AW001189**04**000	1 Jun 2013	• Inserted note that when you turn off the HPLL module you have to wait for at least 5 seconds before turning it on again (section 1.7 on page 4).
		• Inserted the following note:
		"If work on the electric system with power switched on is required (e.g. resetting the LCU, this work must only be carried out by a skilled electrician or by specially instructed personnel."
		in the following sections:
		  • section 1.3 on page 2
		  • section 9.1 on page 37
		• Inserted note on BF and DF HPLL illumination modules in
		  • section 9.2.1 on page 39
		  • section 9.2.1.1 on page 40
		  • section 9.2.1.2 on page 43
		• Added new sections in chapter 8 "Service":
		  • “Resetting the Operating Time Counter of the LCU” on page 34.
		  • “Setting the Calibration Factors for the HPLL Illumination Modules” on page 34.
		• Updated section 9.2.1.1 on page 40 (calibration factor and note on BF and DF HPLL illumination modules).
		• Updated 9.2.4 on page 46: inserted note on calibration factor and added cross-references to Section 8 ’Service’.
		• Updated Section 8:
		  • Inserted section 8.1 on page 33 from section 8 (removed it in section 8).
		  • Inserted new sections in chapter 8:
		section "Resetting the Operating Time Counter of the LCU" on page 34 and section "Setting the Calibration Factors for the HPLL Illumination Modules" on page 34.

AW001189**05**000	30 Sep 2013	Updated section "Preparing an HPLL Module for Transport and Operation" on page 7.
AW001189**06**000	14 Mar 2014	Due to mechanical modifications, inserted new HPLL photographs in various sections of the HPLL manual.

Table 8: Revision History

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Appendix A Electric Service Documentation (CD001857xx)

Operating Voltage	:	230V / 47...63Hz
Control Voltage	:	
Rated Current	:	max 1,5A
Rated Current Of Fuse	:	max 10A

Electrical-Documentation

Project : HPLL

Documentnumber : CD 001857xx

drawn with ELCAD (R)

c				Date	16.12.2010		BASLER Vision Technologies	CD00185708	=	
b				Drawn				HPLL	+	
a				Checked	P.Günter			1 Cover page		Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		1 Sh.

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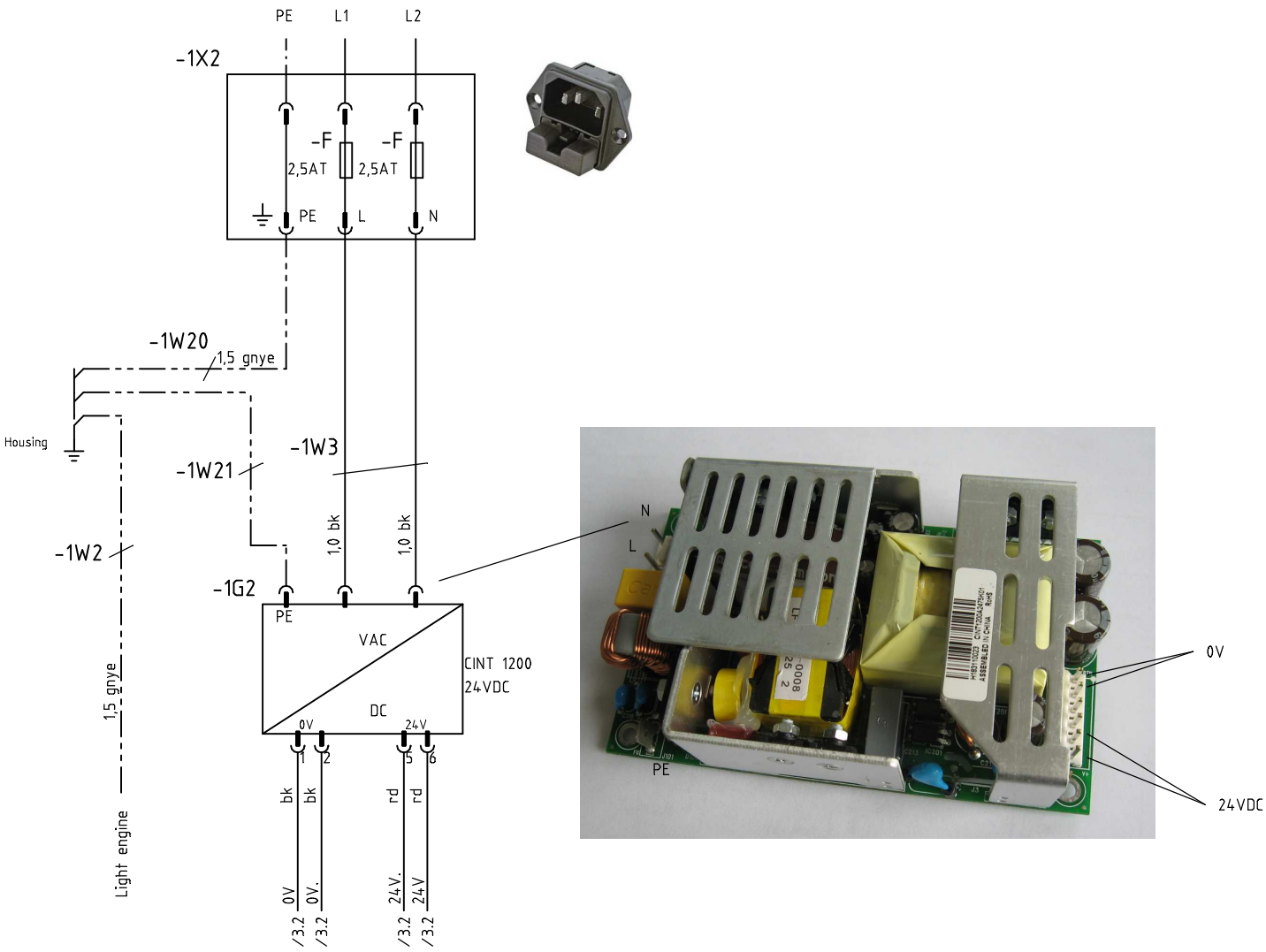
1st Notation	2nd Notation	Sheet	Description	Date	Special remarks
HPLL	1 Cover page	1		16.12.2010	
HPLL	2 Contents	1		16.12.2010	
HPLL	4 Wiring diagram	1	power supply	16.12.2010	
HPLL	4 Wiring diagram	3	LCU Power supply	16.12.2010	
HPLL	4 Wiring diagram	5	outputs control unit	21.12.2010	
HPLL	4 Wiring diagram	7	outputs control unit	21.12.2010	
HPLL	5 Plan of structure	11	Inside view	03.04.2012	
HPLL	5 Plan of structure	12	Backside view	03.04.2012	
HPLL	5 Plan of structure	13	Light engine	03.04.2012	
HPLL	5 Plan of structure	15	LCU	03.04.2012	
HPLL	7 Part list	1		07.01.2011	
HPLL	7 Part list	2		07.01.2011	
HPLL	8 History of changes	1		07.01.2011	

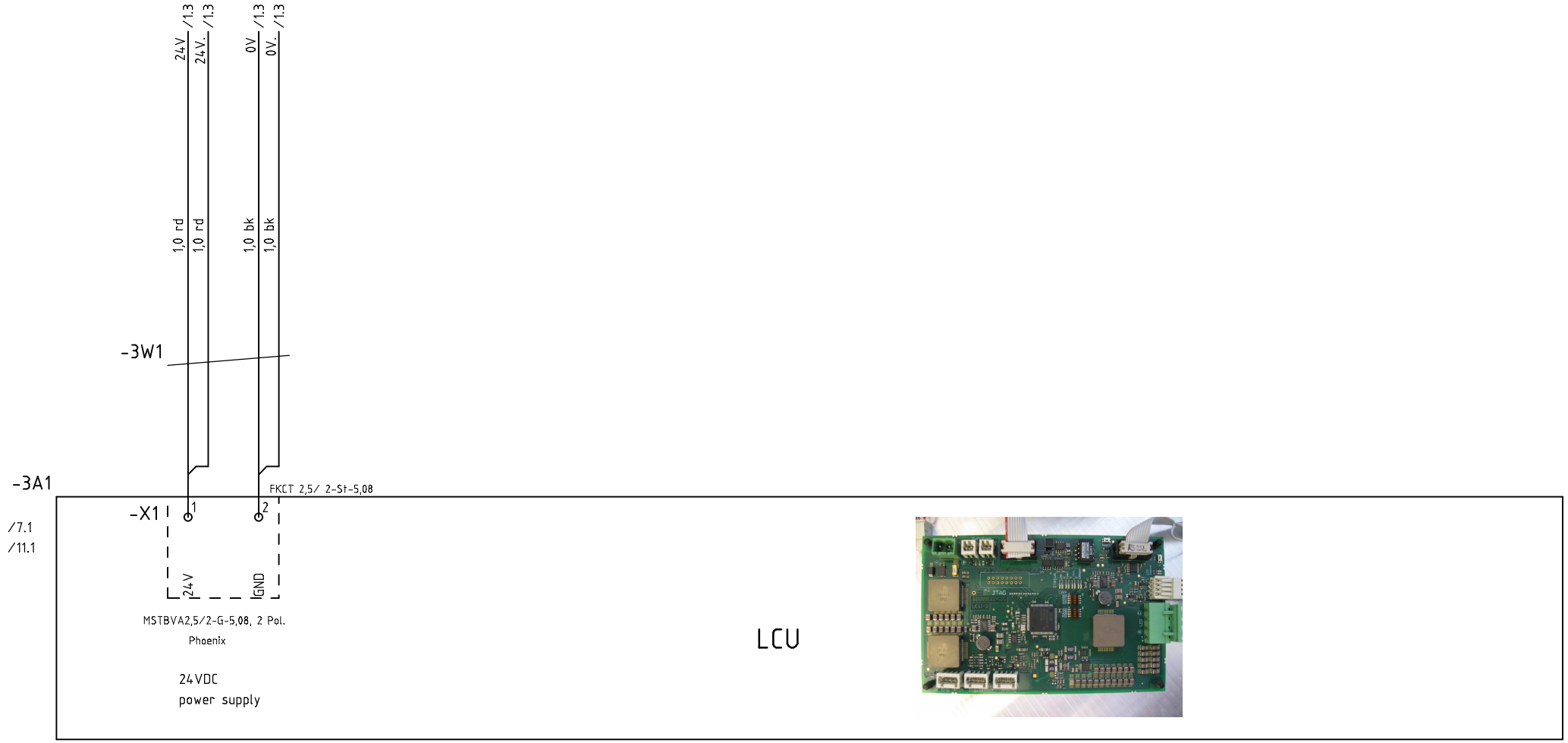
c				Date	16.12.2010		BASLER Vision Technologies	CD00185708		=
b				Drawn				HPLL		+
a				Checked				2 Contents		Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		1 Sh.

230VAC, 47...63Hz
fuse: max 10A



Power supply LCU

c				Date	16.12.2010		BASLER Vision Technologies	CD00185708		=	
b				Drawn				HPLL		+	
a				Checked	P.Günter			4 Wiring diagram		power supply	Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:			4 Sh.



24VDC
Power supply

c				Date	16.12.2010		BASLER Vision Technologies	CD00185708	=	
b				Drawn				HPLL	+	
a				Checked	P.Günter			4 Wiring diagram	LCU Power supply	Sheet 3
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		4 Sh.

-3A1
/3.1
/11.1

24VDC
Wago 733-332
-X2
24VDC
GND
1
2
Wago 733-102

24VDC
Wago 733-332
X3
24VDC
GND
1
2
Wago 733-102

LED
FKIC 2,5 HC/ 4-ST-5,08 - 1942617
X8
LED_A
LED_A
LED_C
LED_C
1
2
3
4
MSTB 2,5 HC/4-ST-5,08

NTC/Photodiode
Wago 733-364
X7
NTC_N
NTC_P
PD_C
PD_A
1
2
3
4
Wago 733-104

Digital in
Wago 733-334
-X9
GND
1
2
3
4
Wago 733-104
0,25 rd

1,0 vio
1,0 vio
1,0 ye
1,0 ye
0,08 bn
0,08 pk
0,5 gy
0,5 gn

rd
bk

Length of wires:
130mm

Light engine

-5W5
-5W6

rd
bk

U
V
M
-5M2
2.6
Papst
Fan housing

U
V
M
-5M3
Jamicon
Fan Light Engine

-5V5
LED
PT100
Thermoelement
Luminus Phlatlight 90W CBM-360-D32

-5V6
A
C
Osram SFH206
Sidelooker

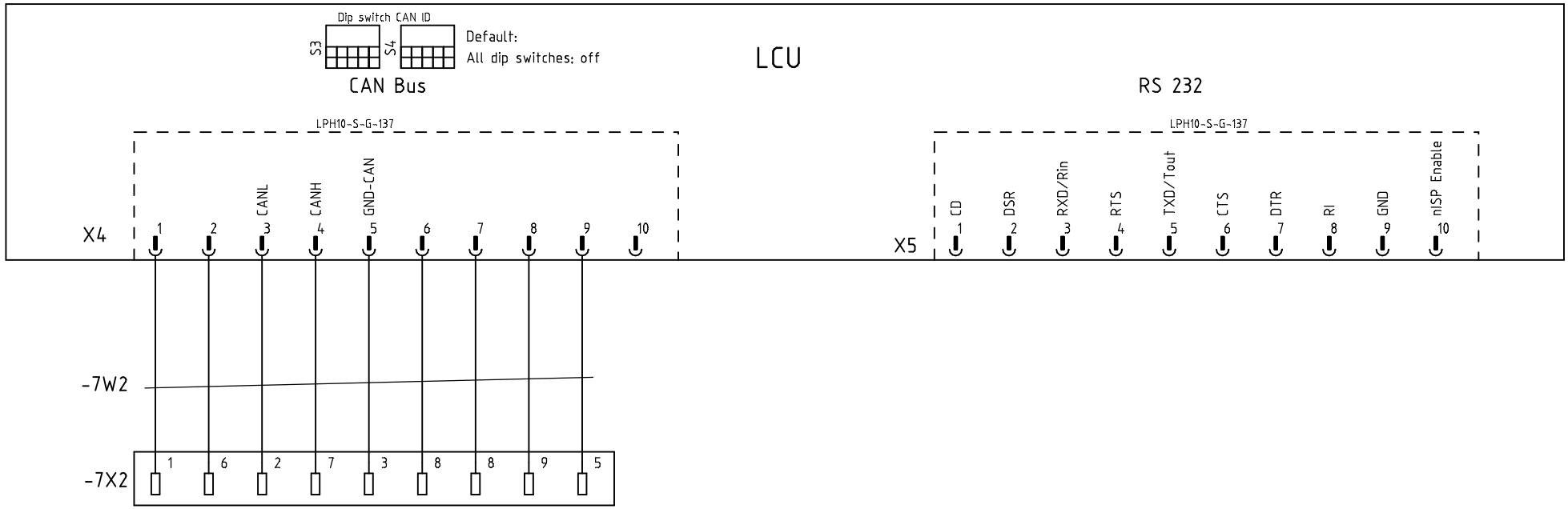
2
1
+
–
LED
Light intensity

* Plug Molex: 51146-0200
Contact Molex: 50641-8141

c				Date	21.12.2010	BASLER Vision Technologies	CD00185708	=	
b				Drawn			HPLL	+	
a				Checked	P.Günter		4 Wiring diagram	outputs control unit	Sheet5
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		4 Sh.

-3A1

/3.1
/5.1

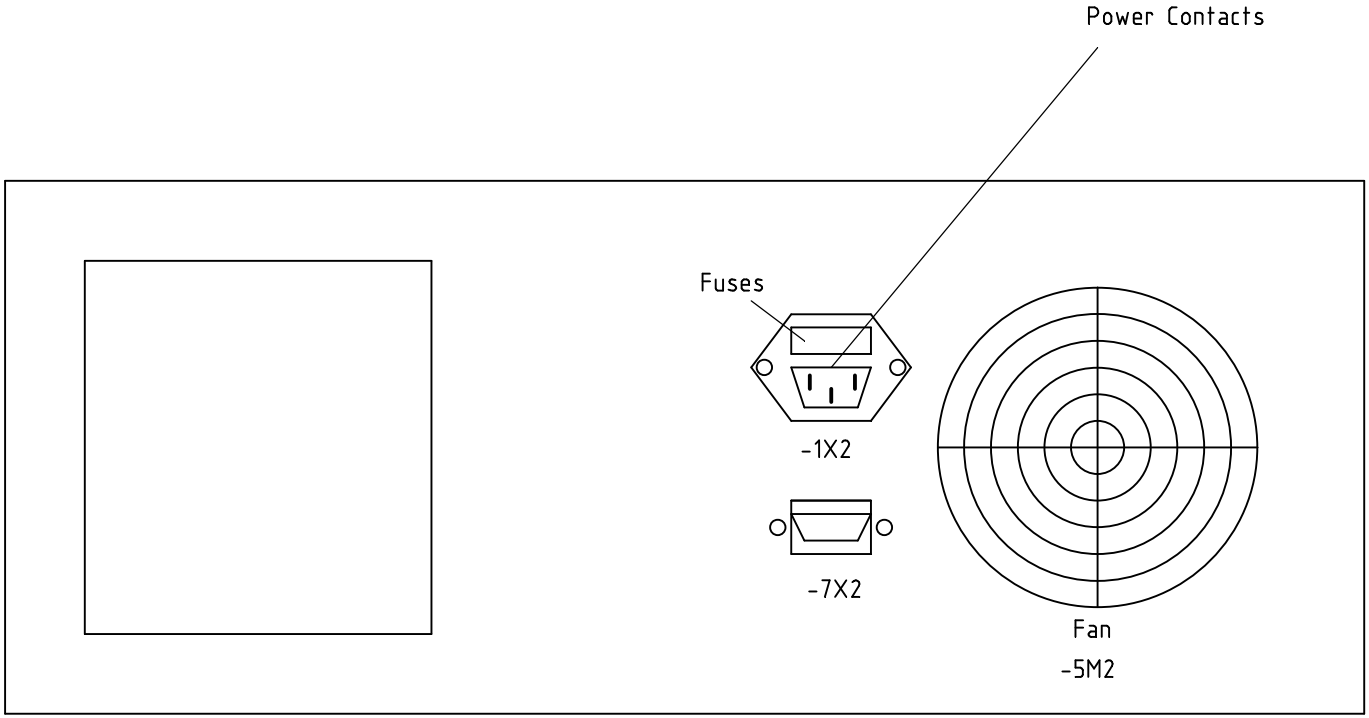


CAN Bus

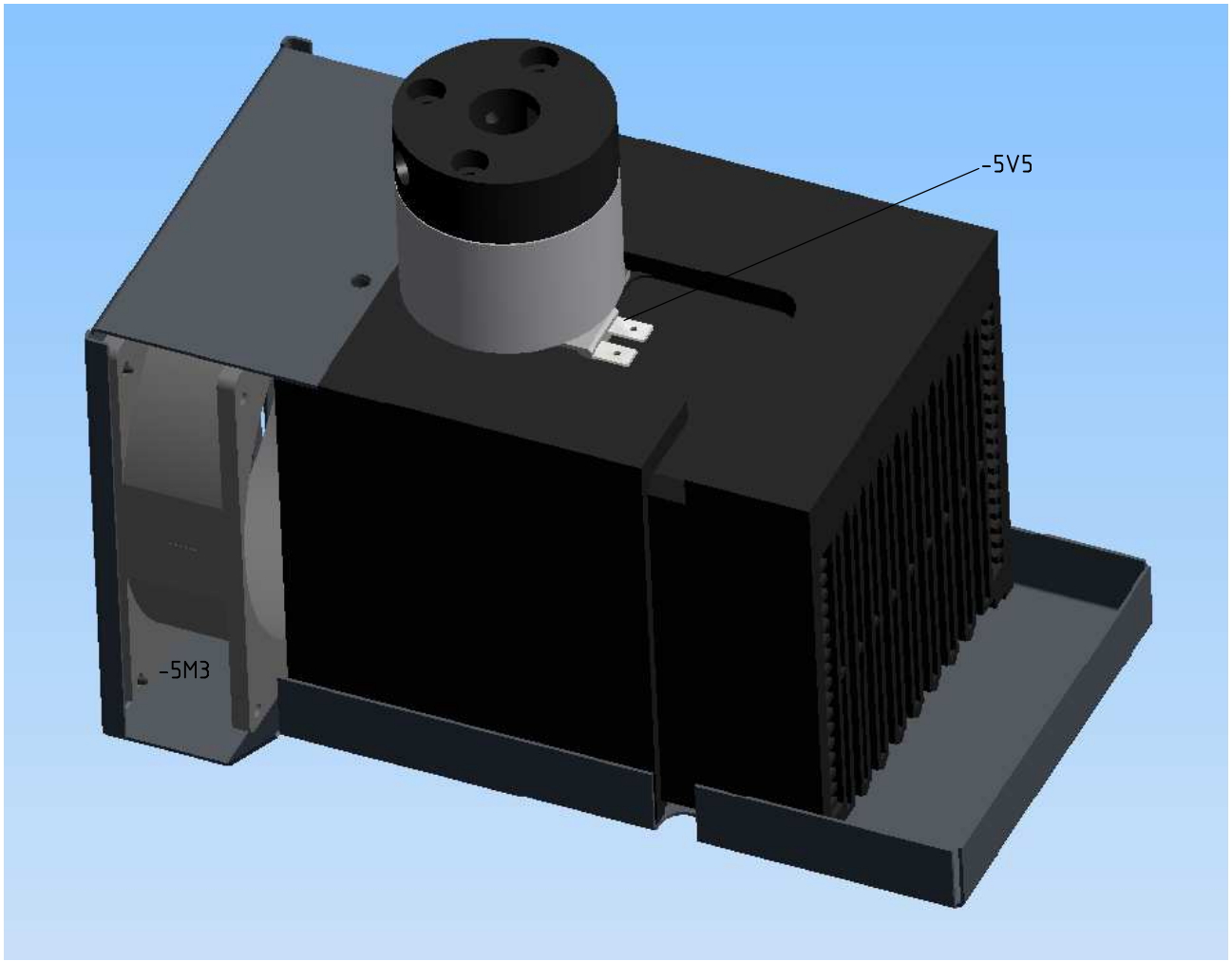
c				Date	21.12.2010		BASLER Vision Technologies	CD00185708		=
b				Drawn				HPLL		+
a				Checked	P.Günter			4 Wiring diagram	outputs control unit	Sheet 7
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		4 Sh.

Cable outlet fan on this position
length of cable: 110mm

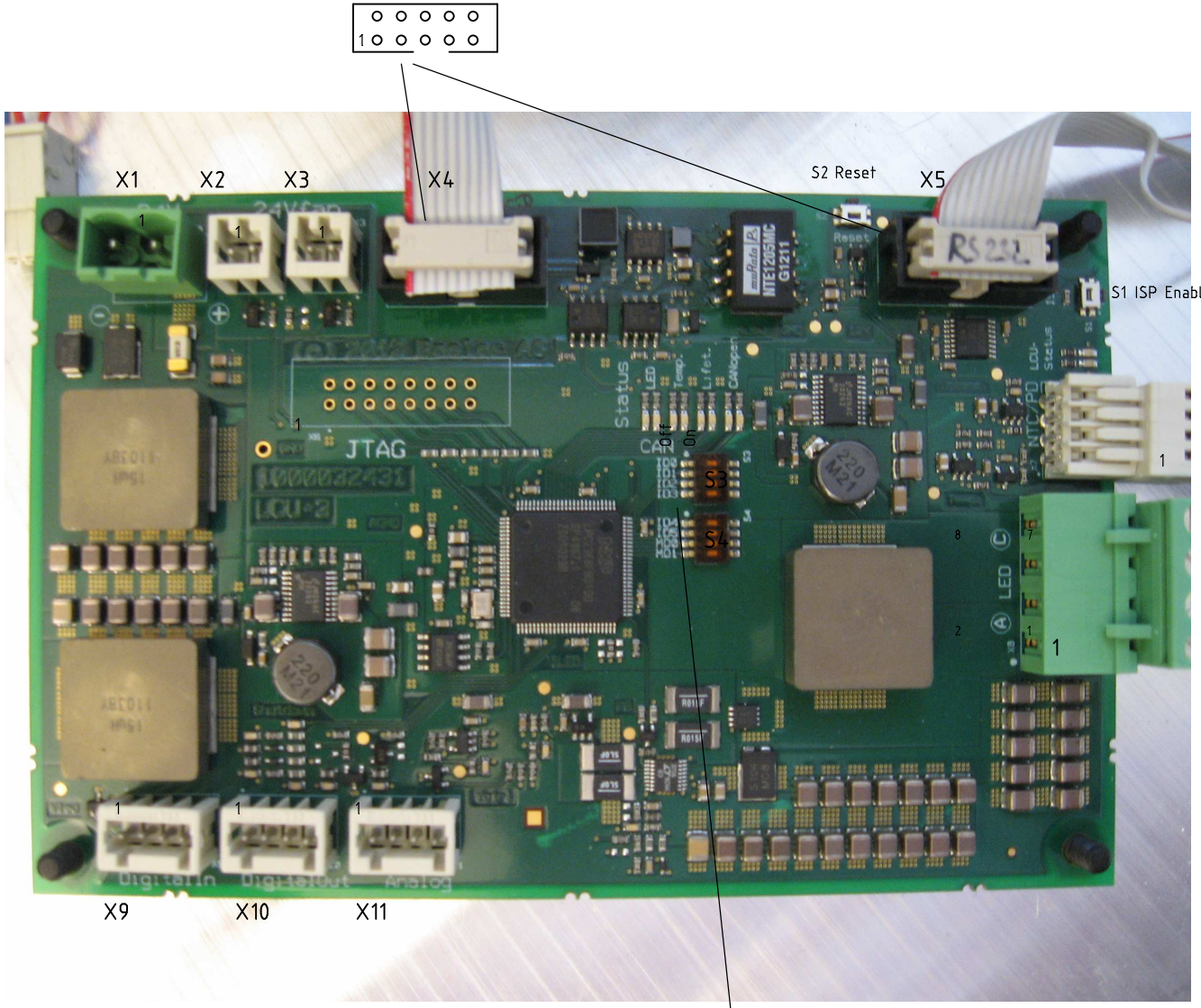
c				Date	03.04.2012		BASLER Vision Technologies	CD00185708	=
b				Drawn				HPLL	+
a				Checked	P.Günter			5 Plan of structure	Inside view
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 11 4 Sh.



c				Date	03.04.2012		BASLER Vision Technologies	CD00185708	=
b				Drawn				HPLL	+
a				Checked	P.Günter			5 Plan of structure	Backside view
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Sheet 12 4 Sh.



c				Date	03.04.2012		BASLER Vision Technologies	CD00185708	=	
b				Drawn				HPLL	+	
a				Checked	P.Günter			5 Plan of structure		Sheet 13
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	Light engine	4 Sh.



c				Date	03.04.2012		BASLER Vision Technologies	CD00185708	=
b				Drawn				HPLL	+
a				Checked	P.Günter			5 Plan of structure	LCU	Sheet 15
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:		4 Sh.

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
1	1.00	1000032237	Power supply 24VDC/200W	-1G2	=/1.2	SL.Power Electr.Corp.
	St					CINT 1200X2475K01
2	1.00	1000032342	PE cable 260mm	-1W2	=/1.2	Basler
	St					CD001878xx
3	1.00	1000031341	wire 1,0 bk	-1W3	=/1.3	Basler
	St					CD001877xx
4	1.00	1000031339	PE wire 170mm	-1W20	=/1.2	Basler
	St					Cd001878xx
5	1.00	1000031333	PE cable 230mm	-1W21	=/1.2	Basler
	St					CD001878xx
6	1.00	1000030684	Socket 6220.2300	-1X2	=/1.2	Schurter
	St					6220.2300
7	1.00	1000018946	IEC fixing clip	-1X2	=/1.2	Bulgin
	St					KT0006
8	2.00	1000002184	Miniature fuse, 5x20mm, 2.5A time-lag	-1X2	=/1.2	Schurter
	St					0001.2508
9	1.00	1000032606	Board, LCU V3.0	-3A1	=/3.1	Basler
	St					SAP
10	1.00	1000031338	Cable FKCT 400mm	-3W1	=/3.1	Basler
	St					CD001881xx
11	320.00	1000016013	shaft tube, slotted 10,5/14,1mm	-3W1	=/3.1	PENDUIT
	mm					CLT38F-C20
12	1.00	1000005822	Fan, 80x80, 24V, S3	-5M2	=/5.2	Papst
	St					8414 NGH
13	1.00	1000031335	Fan with Wago plug	-5M3	=/5.3	Basler
	St					CD001880xx
14	1.00	1000031350	LED Phlatlight CBM360	-5V5	=/5.5	Luminus
	St					Phlatlight 90WCBM-360-D32
15	1.00		part of -5W6	-5V6	=/5.7	
	St					
16	1.00	1000032660	LED cable	-5W5	=/5.5	Basler
	St					CD001899xx
17	1.00	1000032661	Cable PT 100	-5W6	=/5.6	Basler
	St					CD001900xx
18	1.00	1000031337	Cable CAN 370mm	-7W2	=/7.2	Basler
	St					CD001882xx
19	1.00	1000001869	Mounting kit, D-SUB/through-hole mount	-7X2	=/7.2	Provertha
	St					5313 S 43 Y A002
20	1.00	1000002870	Micro female connector, 2p, RM2.5	-X2	=/5.1	Wago
	St					733-102

No.	Piece ME	Identnumber	Description	Identification	location	Manufacturer Partnumber
21	1.00 St	1000032344	Plug with bridge	-X9	=/5.7	Basler CD001894xx

c				Date	07.01.2011		BASLER Vision Technologies	CD00185708
b				Drawn				HPLL
a				Contr.				7 Part list
	Updated	Date	Name	Stand.		Replaced by:	Replacement for:	Original:

=			
+			
			Sheet 2
			2 Sh.

Distributor :

Revision	Changed from:	Date of release:	Released from:	Description of modification:
06	P.Günter			Wiring diagram sheet 5, 12; part list -3A1
07	P.Günter	04.12.2012	P.Guenter	Wiring diagram sheet 5, part list -5W5/5W6 ; sheet 15, LCU-V3
08	P.Günter	08.04.2014	P.Guenter	Wiring diagram sheet 5, X3, X9 ; GND fan light engine

c				Date	07.01.2011		BASLER Vision Technologies	CD00185708	=
b				Drawn				HPLL	+
a				Checked				8 History of changes	Sheet 1
	Updated	Date	Name	Stand.		Replaced by:	Replacement:	Original:	1 Sh.

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